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Coke Oven Carbonization.

[A paper read by MR. W. CHANEY at the last meeting, British Institution of Gas Engineers.]

Considerable progress has been made abroad in the adapation of the by-product oven for the manufacture of illuminating gas. In this country, however, very little real attempt has been made to apply coke oven gas for town lighting, although large quantities of of surplus gas from coke oven plants are utilized for power purposes. The principal objection to it has been its varying composition and low illuminating power; and to some extent it as well as other modern methods of carbonization have been hampered by the restrictions prescribed by Parliament for methods of testing gas. A slight alteration in the constituents of the gas, such as might be made by chamber oven carbonization, materially and unjustly penalizes the gas, when tested with the No. 1 argand burner. These advantages are more than compensated for, when a calorific standard is adopted, or the No. 2 "Metropolitan" burner prescribed.

The Corporation of Birmingham recently considered the remodelling of their carbonizing plant, and, bearing in mind the demand for furnace coke, their choice fell upon coke ovens. Several installation were inspected in Germany and elsewhere, and it was finally decided to recommend the adoption of Koppers' chamber ovens—these being specially designed for the production of town gas and furnace coke. A battery of 12 ovens with the necessary coal stamping equipment, was put to work at Saltley in October last, and recently they have decided to increase this installation by 54 ovens, making 66 in all. The ovens are heated by outside producers of the Mond gas type; and these producers, when the full battery is completed, will work under ammonia recovery conditions.

The method of manufacture of Mond gas is well known; but as several points in its manufacture contribute to the economies of coke oven plants as a whole, the author may be pardoned for briefly describing the process again. (Fig. 1 shows the plant diagrammatically.) The producer may be charged with a mixture of either coke dust or small breeze, and coal slack. The bottom of the producer is sealed in water, into which the ash falls, and is removed without interfering with gas making. Saturated air is blown continuously through the producer, and by control of the temperature of saturation, the formation of clinker is avoided, the ash from the fuel being the only residue. The gas, on leaving the producer, passes through a superheater, round which the air circulates on its way to the producer. From the superheater the gas passes to a mechanical washer with revolving "dashers," where it is washed with a spray of water, separating a portion of the dust and tar. From the washer, the gas passes to the ammonia absorbing gas coolers; und finally through centrifugal fans and sawdust scrubbers, for the elimination of the last traces of tar, etc.

The coke ovens are 35 feet long and 8 feet 10 inches high; the width tapering from 18 to 19½ inches. They are heated by Koppers' regenerative principle of preheating both the producer gas and the secondary air. The regenerators are arranged under the ovens, each oven having a separate regenerator, divided into two sections by a partition wall *C* (Fig. 2). The secondary air regenerators alternate with the gas regenerators—*A* and *B*. On each side of the ovens are a series of vertical flues, forming the combustion chamber, *E*, also divided by a center wall. The air, *A*, and the producer gas, *B*, flow through the checker brick, meeting at the bottom of the vertical flue, *D*, the products of combustion passing through the vertical flues, *E*, into the common horizontal flue, *G*, over the center division wall, down the corresponding flues on the other side, through the regenerators into the main flue. By an ingenious arrangement of valves connecting each oven with a central "change over" gear, the admission of secondary air and producer gas is reversed from one side of the oven to the other every half hour; and by this arrangement the preheating of both the producer gas and the secondary air is effected.

Particular attention is directed to the point at which the gas and air are combined. The point of ignition is directly opposite the bottom of the charge, so that the greastest heat is applied to that part of the oven in direct contact with the coal; the sole and the crown not being subjected to an intense heat. By this means, a uniform heating is obtained, the coke cleaving in parallel lines.

The producer gas regulation is effected by means of a gas cock; the secondary air adjustment by thin strips of metal placed over the air intake; and each vertical flue is controlled by an independent damper. All the flues are accessible, and the temperature generally may be controlled with exactitude. The coal for carbonization is first broken to about 1½ inches and, to produce a dense furnace coke, is further ground to a fine dust. The coal may be charged into the

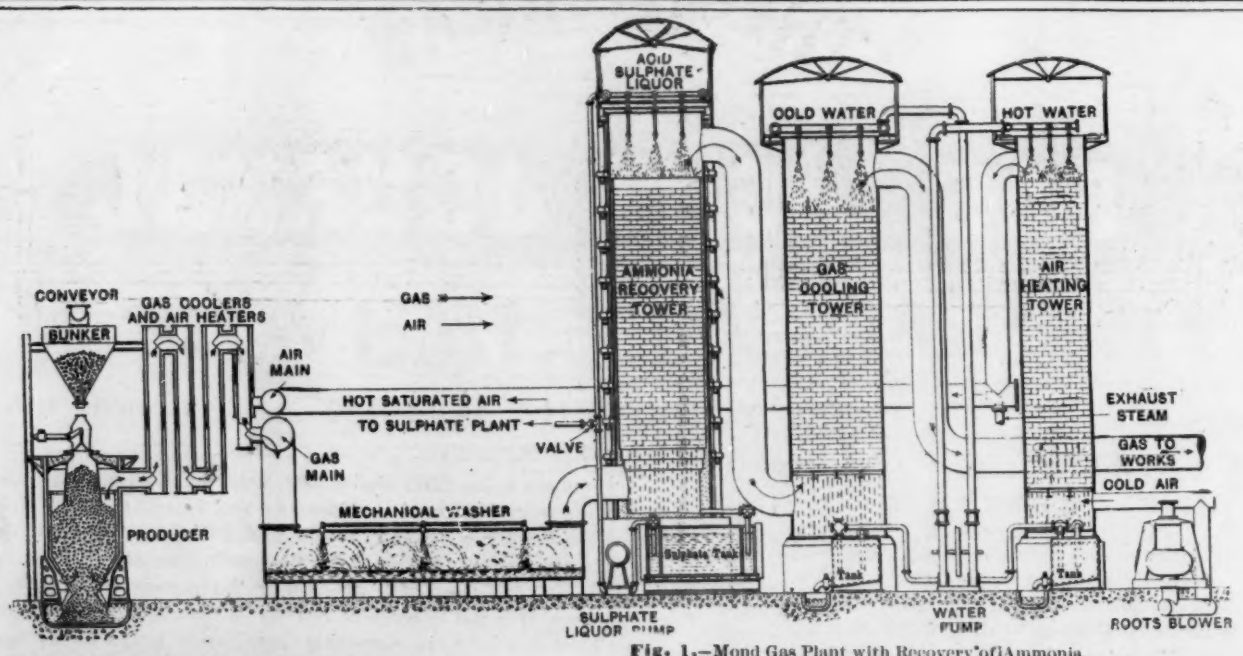

Fig. 1.—Mond Gas Plant with Recovery of Ammonia.

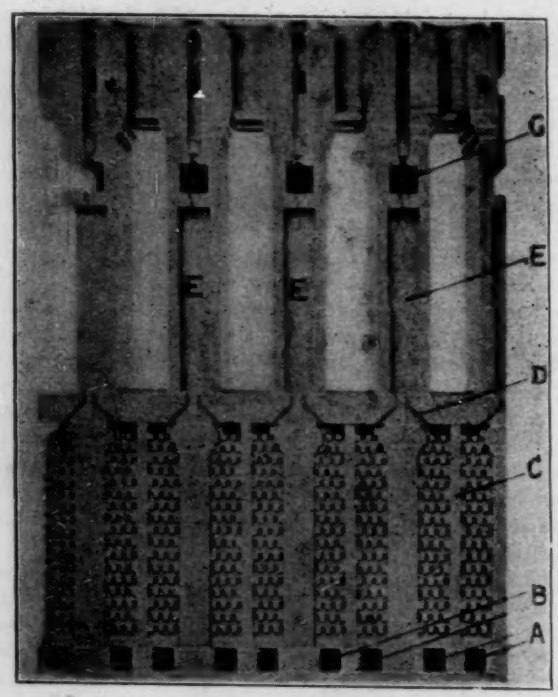

Fig. 2.—Cross Section Through Ovens and Regenerators.

Fig. 4.—Goodall's Coke Quenching Machine.

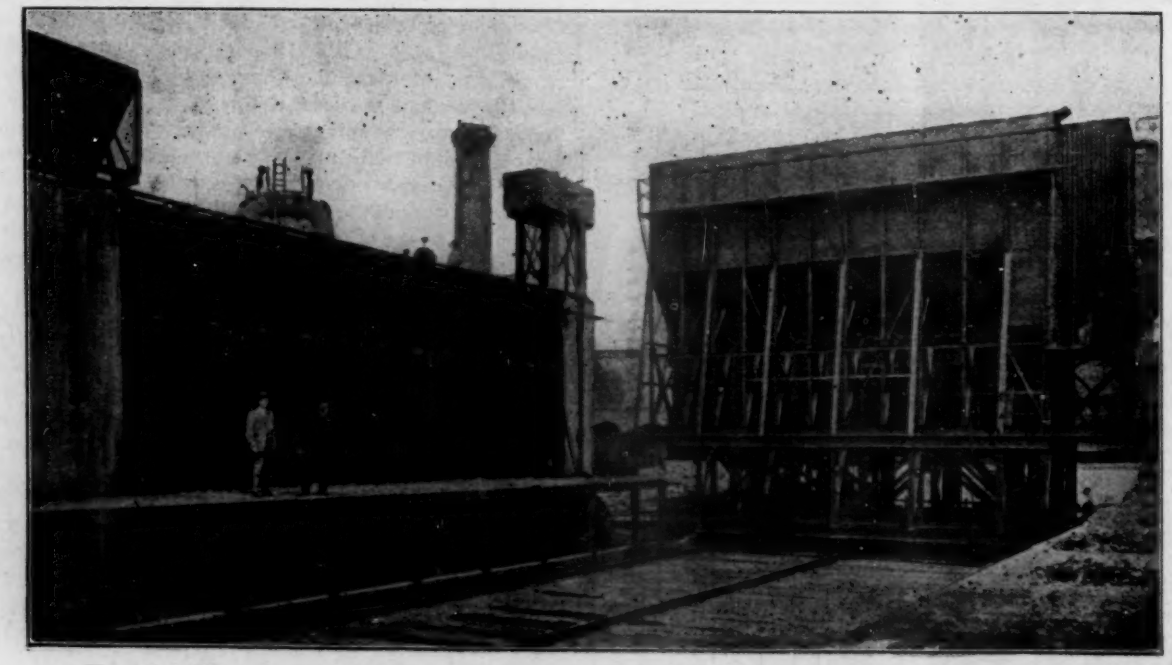

Fig. 3.—Charging Side of Ovens with Stamping Machine on the Right.

ovens from a trolley running on rails along the top of the oven; or it may be compressed into a solid cake by a stamping machine (Fig. 3), and introduced through the end of the oven.

The stamping machine consists of a steel box, corresponding in size to the oven, travelling on wheels on the oven terrace. The pulverized coal is compressed by a stamper, layer by layer, in the box, and then introduced into the oven as a solid cake.

The doors of the oven are secured by a self-sealing device. They are of necessity heavy in construction, and are kept cool by a water circulation round the frame of the door. No luting is required, and the doors do not warp.

The coke is discharged from the oven by an electrically driven ram, into a "Goodall" coke quencher. The quencher (Fig. 4) consists of a frame running on wheels, and electrically driven. The frame carries a circular perforated platform corresponding to the level of the coke oven, and made to rotate either clock or anti-clock wise. The coke is pushed first through a "Darby" quenching hood, on to the revolving platform, over which it is gradually and evenly spread. A series of spray pipes, are arranged round the quencher and over the revolving platform. When all the coke has been discharged from the oven, the surplus water is allowed to drain—usually a few minutes will suffice. The motion of platform is then reversed, and a hinged door, forming part of the horizontal side of the quencher, is opened inwards towards the center of the revolving platform, and so guides the coke over a jigging screen into railway cars.

The gas off-take pipes from the ovens connect to a dry collecting main. The temperature in this main is so high that no water vapor can condense; and to prevent deposition of pitch, cold, thin tar is pumped through continuously. Suitable valves are arranged to shut off the ovens from the main; in addition, a pipe connects the oven with the chimney stack, for the removal of smoke while the ovens are being charged and discharged.

The heating of the trial installation at Saltley is by a single producer, working under non-recovery conditions, and without efficient extraction of the tar and dust. This, together with the want of a relief holder, to store the gas, while the change over gear in connection with the ovens is being operated, militated against satisfactory results, so far as fuel expenditure was concerned. The producer gas, during the change over period, is blown into the atmosphere, and the tar and dust causing leakage through the secondary air and spent gas valves.

The fuels first employed were a mixture of 50 per cent. of small coal, about ⅛ to ¼ inch in size, and 50 per cent. of coke dust.

The analysis of the fuels were as follows:

	Carbon (Dry Basis). Per Cent.	Moisture. Per Cent.	Ash (Dry Basis) Per Cent.
Coal slack	73.0	10.6	4.5
Coke dust	79.7	6.2	13 4

Average calorific value of mixture 12,280 B.Th.U. gross per pound of fuel, dry.

Unfortunately, after a few days' working with this mixture, clinkering troubles developed; and having but one producer to rely on, it was abandoned. From the general results obtained, it would appear possible to use coke dust and coal slack; but the fuels would be better gasified in separate producers. The average calorific value was 130 B.Th.U. per cubic foot, net. The producer was then charged with small coal. The average analysis of the gas produced was as follows:

	Per Cent.
Carbonic acid	9.5
Oxygen	0.3
Hydrocarbons	0.3
Carbonic oxide	20.0
Hydrogen	17.8
Methane	2.8
Nitrogen	48.9
Sulphuretted hydrogen	0.4
	100.0

Analysis of fuel.

Water, 10.0 per cent.
Ash, 5.4 " "

Fuel consumption 15.73 per cent. of combustibles on the raw coal carbonized.

B.Th.U. per cubic foot, net	147
Approximate yield of gas per ton of fuel	130,000 cubic feet
Temperature of blast saturation	159° Fahr.
" gas at outlet of generator	1100° "
" chamber oven	1922° "
" waste gas	420° "
" producer gas entering ovens	66° "

Analysis of waste gas—

Carbonic acid	14.1
Oxygen	1.8
Carbonic oxide	nil

Ashes from producer—

	Per Cent.
Moisture	18.1
Combustibles	2.0

The high percentage of fuel used was influenced by the circumstances previously mentioned. Figures recently published of a similar installation at Vienna gave the fuel consumption as 10 per cent. on the coal carbonized, the producers being charged with coke dust and small breeze, and worked under non-recovery conditions.

Assuming that 12 per cent. of fuel is consumed per ton of coal carbonized in the ordinary method of heating retorts, it is questionable whether this figure can be reduced by outside producers, working under ammonia recovery conditions. On the contrary, unavoidable losses of sensible heat by radiation and conduction tend to increase the fuel expenditure; but the recovery of ammonia, the employment of inferior fuel, and the liberation of coke, are economies to be considered in the adoption of outside producers.

Table I. shows the cost of fuel per ton of coal carbonized with outside producers under recovery conditions; using small coal alone, and mixed with equal quantities of coke dust.

TABLE I.

	Uncompres'd Coal		Compressed Coal.	
	All Coal Slack.	50 Pr. Ct. Slack, 50 Pr. Ct. Coke Dust.	All Coal Slack.	50 Pr. Ct. Coal 50 Pr. Ct. Coke Dust.
	12 Pr. Ct. of Fuel on Coal Carbonized.	11 Pr. Ct. of Fuel on Coal Carbonized.	15 Pr. Ct. of Fuel per Ton of Coal Carbonized,	15 Pr. Ct. of Fuel per Ton of Coal Carbonized.
	Per Ton of Coal Carbonized.	Per Ton of Coal Carbonized.	Per Ton of Coal Carbonized.	Per Ton of Coal Carbonized.
	Cents.	Cents.	Cents.	Cents.
Small coal, at $2.45 per ton	28.80	14.40	36.00	18 00
Coke dust at 37 cents per ton	...	2 16	...	2.70
Boiler fuel.. 50 pr. ct. dust, at 37c. / 50 pr. ct. breeze, at $1.92.	0 66 / 3.28	0.66 / 3.28	0.72 / 3 58	0.72 / 3 58
Labor	6.56	6.56	7.68	7.68
Repairs, Maintenance, Depreciation, Interest — 20 per cent	14 58	14.58	17.06	17.06
Oil and waste	0.58	0.58	0 68	0 68
Acid, at $7.25 per ton	3 12	2.08	3 90	2 60
Bags and packing	0.72	0.48	0 92	0 60
	58 30	44 78	70 54	53 62
Sulphate recovered, at $63 per ton	30 10	20.04	37.62	25.04
Total cost of heating per ton of coal carbonized	28.20	24.74	32.92	28.58

TABLE II.—*Cost of Heating Retorts by Regenerative Furnaces, Based upon 12 Per Cent. of Fuel Per Ton of Coal Carbonized.*

	Per Ton of Coal Carbonized.
Coke, at $3.40 per ton	40.4 cents.
Labor	5.4 "
Repairs to furnaces, stokers' tools, and depreciation	2.0 "
Total cost of heating per ton of coal carbonized	47.8 "

The value of the nitrogen content in the dust being approximately 1 per cent., and in the coal slack 1.4 per cent., an adjustment for the sulphate of ammonia recovered on this basis has been made. The

value of the coke liberated from the ovens by the use of outside producers is appended, as is also the cost of heating retorts by the ordinary regenerative method. The quantity of air required for the combustion of 100 volumes of Mond gas is approximately 120 volumes, and this lends a very easy means of adjustment.

Another economy can be effected with outside producers when generating electric current. For a plant similar in size to the extended Saltley installation, about 400 kilowatts per hour is necessary. For the production of the producer gas, approximately 2¼ pounds of low pressure steam are required for each pound of fuel gasified under recovery conditions. This steam can be first used for driving the generators, and the exhaust steam passing to the blast mains for saturation purposes. With allowance for depreciation, maintenance and other charges, the cost of producing current by this means approximates 6 cents per unit.

As regards the selection of coal for the ovens. An expanding coal is not desirable, owing to difficulty of discharge; the sulphur and ash content are also important factors, as is also the amount of alkali. Many oven builders, in giving guarantees, protect themselves by limiting the amount of sodium or potassium chlorides in the coal to be used, to 1 gramme per liter of water. The alkali salts have a very important bearing upon the life of the oven walls, and in many instances repairs to the same have been necessary after but few months working, when the coal employed was heavily charged with salt. Many coals from certain Midland districts are poor in caking qualities, and compression is necessary to produce a hard furnace coke. Such coals contain, in their raw state, from 4 to 7 per cent. of water, which has to be increased to about 12 per cent. when stamping. The period of carbonization for stamped coal is about 30 hours, and for unstamped coal 24 hours. The coke produced by the two methods [samples exhibited] differ very greatly physically.

First sample—Coal nuts about 1¼ inch cube charged into oven through top doors.

Second sample—Coal nuts disintegrated, but unstamped, charged into oven through top doors.

Third sample—Coal nuts disintegrated, stamped and charged with stamping machine.

The working of the installation for the first few months was naturally more or less of an experimental nature, the primary object being to ascertain how the illuminating power and the calorific value compared with other modern systems. The following figures were obtained from a mixture of 50 per cent. South Yorkshire coal and 50 per cent. of Derbyshire coal, unstamped.

Duration of test	7 days.
Number of ovens charged	84.
Gas made, corrected for temperature and barometer (CO_2 not removed)	8,219,000 cubic feet.
Coal carbonized raw	750.39 tons.
Analysis of coal—	
Water	4.0 per cent.
Ash	4.5 "
Gas made per ton of coal, corrected for temperature and barometer	12,640 cubic feet.
Illuminating power, No. 1 burner (CO_2 not extracted)	14.05 candles.
Illuminating power, No. 2 burner (CO_2 not extracted)	17.00 "
Calorific value	500 B.T.U., net, per cubic foot.
" multiple	6,430.
Specific gravity of gas	0.437.

Analysis of Gas.

	Per Cent.
Carbonic acid	2.1
Hydrocarbons	2.9
Oxygen	0.7
Carbonic oxide	7.8
Hydrogen	50.0
CH_4	30.0
Nitrogen	6.5

Sulphur in gas, other than H_2S, 30.7 grains per 100 cubic feet.

Cyanides as $Na_4Fe(CN)_6$, 3.34 lbs. per 10,000 cubic feet.

Tests of Gas. Daily Average of Three Samples, each Collected over a Period of Eight Hours. Unstamped Coal Charges. 50 per Cent. South Yorkshire and 50 per Cent. Derbyshire Coals.

Calorific Value B.T.U. Net.	Illuminating Power. No. 1 Argand.	No. 2 Argand.	Temperature of Ovens.
508	14.08	16.05	1043
509	14.68	17.23	1045
479	13.03	15.38	1032
501	13.67	16.57	1043
503	14.48	18.03	1072
506	14.22	17.27	1064
507	14.23	17.63	1075
490	13.68	16.53	1060
Average 500	14.00	17.00	1054

It was not possible to isolate the tar and liquor produced, but the yield of liquor appears to be quite equal to that obtained by other systems of carbonization; and certainly larger than obtained from horizontal settings with a single ascension pipe, using stoking machines.

The tar produced gave an analysis as follows:

	Per Cent.
Light oils up to 170° C	24.9
Creosote oils	25.9
Heavy oil	9.3
Above 270° C	11.4
Pitch, per cent. of total tar	28.0
Free carbon in tar	3.5

The coke, as previously described, is handled by means of a Goodall quencher. The quenching is quick—a necessity with oven coke, the fine color and lustre being largely due to the result of rapid cooling—and with care the percentage of water need not be more than 1 to 2 per cent. The coke is delivered over a jigging screen directly into railway cars, and by this means the labor costs of coke handling, and breakage due to conveying and screening are considerably reduced.

Table Showing Percentage of Coke, Breeze, and Dust made, Per Ton of Unscreened Coke.

	Coke Screening and Conveying Plant. Inclined Retorts.				Coke Ovens. Goodall Quencher.			
	Per Cent.	Cwts.	Qrs.	Lbs.	Per Cent.	Cwts.	Qrs.	Lbs.
Coke	74.6	14	3	19	87.7	17	2	4
Breeze	16.1	3	0	25	9.4	1	3	15
Dust	9.3	1	3	12	2.9	.	2	9
		20	0	0		20	0	0

With the stamped charges, the coke is, of course, too dense for other than furnace work. The coke produced from the hand charged ovens, although more dense than gas coke, is suited for ordinary purposes, and it is only a matter of creating a demand for the improved material. Specific gravity of coke from coal nuts, not disintegrated, equals 1.59. Disintegrated and compressed equals 1.81. The price of furnace coke in Birmingham at present is several shillings more than gas coke.

The installation at Saltley has not been running sufficiently long; and the unit is too small, to put forward definite figures as regards the cost of labor and repairs. The repairs are facilitated by shutting off the producer gas from the individual oven to be dealt with, without shutting down a whole battery at one time. The allowance for expansion of the brickwork is well adjusted, and there has been no trouble through leakage. It is estimated that the life of the oven should be about six years, and that repairs should not exceed 6 cents per ton of coal carbonized.

With the 66 ovens, two complete sets of machines will be installed —*i. e*, two pushing rams, two stamping machines, and two quenching machines. The compressed charges of thirty hours' duration will necessitate discharging eight to nine ovens per shift, per machine, or 22 ovens with uncompressed coal, per shift.

Estimated Labor Costs.

Coal to Crushers. Coke to Railway Cars.	Stamped Charges. Per Ton of Coal. Cents.	Unstamped Per Ton of Coal. Cents.
Machinemen, Gas regulator men, Tar attendant	7.8	6.2
Coal unloading	2.0	1.6
Odd men	4.8	3.8
Total	14.6	11.6

Excluding men employed upon Mond gas plant.

In comparing these figures with other systems of carbonization, it must be borne in mind that they cover the complete handling of the coal and coke, from the arrival of the coal at the gas works, to loading the coke into railway cars.

The arrangements of the stamping machines and discharging ram

are somewhat different from the usual. Common practice is to charge and discharge the oven from the same side, both operations being performed by one combined machine. The ovens at Saltley taper from 18 inches to 19½ inches at the opposite end; the coal being introduced at the widest end, necessitating the employment of the pushing ram from the narrower end, and the charging machine on the opposite side. Although slightly increasing labor costs, charging and discharging are facilitated, and the charge of coal in the oven increased.

Coke quenching, screening, and loading costs are considerably reduced by the Goodall machine. The method of pushing the coke from the oven to a sloping concrete terrace, and then dealing with the material by hand, necessitated the employment of a number of men for quenching and loading, and much breakage is caused by the intermediate handling between the oven and the wagon. The Goodall quencher performs all these operations with considerable saving of labor and increased yield of coke.

The self-sealing doors of the ovens, although expensive, dispense with the labor of the "door setters" and "dawbers" usually employed in plastering the doors with clay.

The leakage through the joints of the brickwork or the oven walls, is not more than with the ordinary retort; and the large self-sealing doors are quite as efficient as the ordinary retort lid. By maintaining a slight plus pressure upon the ovens, the carbonic acid and nitrogen content in the gas can be kept well under control.

The coal usually employed in the by-product oven is washed slack, the original material containing varying quantities of foreign matter. The quantity of ash in the resulting coke does not appear to materially affect its market value. A recent analysis of one of the best Durham cokes, selling in Birmingham considerably in advance of gas coke, showed 8.4 per cent. of ash, while one of the cheapest Derbyshire cokes gave slightly less ash—the total sulphur being almost identical. The actual value of a furnace coke seems to be more or less governed by the working experience of the ironmaster; and there appears to be no standard method of comparing the density of the coke to fix its market price. With the coke oven, as with the gas retort, high temperatures are essential for the production of hard furnace coke, combined with a high yield of gas per ton of coal carbonized; and providing the oven is uniformly heated, it does not appear that the illuminating gases are broken up to any serious extent.

The question of temperature of carbonization does not materially influence the coke oven manager. For the production of dense coke it is, however, necessary that the whole of the volatile matter be driven off. The temperatures usually employed with the coke oven are, as a rule, much lower than those adopted for a high yield with gas retorts, and the period of carbonization is consequently prolonged. It is during the end of this period that air is drawn into the by-product oven, and the composition of the gas affected. The coke oven unit is of necessity large—the charge per oven being from eight to ten tons; so that their applicability is limited to towns where the fluctuation of the consumption of gas comes within this range.

The author has not been able to institute a comparison between the coke oven and the various modern methods of carbonization, his aim being to place before the Institution such information as would clear the ground for the consideration of the adoption of the coke oven as a practicable method for the utilization of the surplus gas from the by-product oven, and also its utility as an economical method of carbonization as applied to gasworks.

Notes On Industrial Lighting.[1]

[By Mr. E. Leavenworth Elliott.]

To light artificially any large space for whatever purpose, with the petty and mean light-sources which were available until a decade ago, was a well-nigh insuperable task. Then it was that the ingenuity of those who were confronted with the problem was taxed to the uttermost, and did not always result in a successful issue. Daylight was considered an unattainable ideal, a star to which the chariot of artificial light might be hitched only by the theorist and dreamer. To-day conditions are entirely different. Light-sources of large power, both gas and electric, and of practical daylight quality, have rendered the old method of furnishing each workman with a lamp and shade, as obsolete as the older practice of each wayfarer carrying his own lantern when he went out at night. Daylight is no longer the unattainable, but is actually surpassed for certain purposes by its man-made rivals, and readily equaled for every commercial and industrial use. These statements may seem extravagant, but are fully borne out by the facts.

By what tests may the relative merits of natural and artificial illumination be judged? The efficiency of the laborer when working under the different lights, is certainly a most convincing, if not absolutely conclusive, criterion. In these days of high-speed and high-tension operation of both the human and inanimate machines, any difference in facilities must inevitably make itself felt in either the quantity or quality of output, or in both. There are plenty of cases in the industries, from the most accurate and exacting, such as the making of silk fabrics, to the rougher and more gross, such as heavy foundry work, where the products of the night and day shifts are exactly equal.

There is but one other question in regard to this method of judging; how do the two kinds of illumination affect the wear and tear of the human machine? We hear much of the evils of eye-strain produced by bad light, which are probably true in the main. But natural light may be thus abused quite as well as artificial light; and the latter can be so regulated as to give no cause whatever for offence. "We have become a nation of spectacle wearers" is true, as charged in the indictment; but we have discovered that the majority of eyes are naturally defective before middle age, and practically all of them after that age, and have recognized the necessity of remedying these faults in nature's handiwork. Where the best systems of modern artificial lighting are in use there is no evidence of either an undue amount of the disorders attributed to eye-strain—such as headache or nervousness—or of necessity for glasses. Having failed to detect any difference in results upon the organs of vision or their possessor, it will be pertinent to compare the physical properties of the two kinds of illumination.

What are the qualities of daylight which give it the perfection universally ascribed to it? First, it is abundant. It is only when it is of sufficient intensity that it is considered perfect. Insufficient or dim daylight has no more virtue than dim light of any other kind. Second, it is very completely diffused. Direct sunlight is not included in the perfect daylight standard. The daylight that is commended produces no sharply defined, or dense shadows. This is the test for diffusion, which must not be confounded with distribution. Third, it contains all of the visible rays, which is the quality referred to when it is spoken of as "white light." Fourth, it is perfectly steady; that is, it does not waver or flicker.

Such being the specifications of the standard daylight illumination, the relative excellence of artificial lighting may be fairly determined by comparing it, point by point, with these qualities. As to abundance, or intensity; we do not voluntarily use the full strength of daylight, but by preference take the diffused light from the north, that is, from the sky and terrestrial objects. In other words, in practice we aim to use the sun as an indirect lighting unit. When a room is so located that direct sunlight can enter it, we diffuse it by curtains or other means. The intensity of daylight thus produced is easily equalled or surpassed by artificial light, and in any number of instances this condition actually exists in practice. An intensity o artificial light fully equal to average daylight intensity would by no means be considered excessive or extravagant by the engineer. Artificial light may therefore, easily, equal natural light in this respect.

The second point in our daylight standard, diffusion, has been the most difficult of all to reach with artificial light. With light-sources of small power, such as the ordinary gas flame and the 16-candle power electric lamp, it is practically out of the question. With the introduction of high-power sources, however, the possibility of equaling daylight in point of diffusion, has been extended to a very large number of cases, but not to all. In any room with a ceiling it is possible to produce perfect diffusion artificially. All that is necessary is to make the ceiling white, and illuminate it directly with a sufficient quantity of light to produce the desired intensity of illumination throughout the space, when reflected from this surface. The result is exactly the same as daylight of the same intensity, if the entire ceiling were of glass and open to a clouded sky. The luminous sources themselves are easily concealed with opaque reflectors. This is the now familiar method of indirect lighting. To equal daylight in diffusion then, but two things are necessary; a white ceiling and a sufficient quantity of artificial light, neither of which can be very difficult to obtain nor very expensive to use in most cases. If it is

1. "Industrial Engineering"

argued that the ceiling will soon become dirty in the atmosphere common in many of the industries, it may be answered, so will the windows; and that is about all there is to the argument. Dirt has the same absorptive effect upon sunlight as it has upon any other light, and if you are bound to have natural light without ever resorting to the cleaning process, you will have to stay out of doors to get it.

In regard to the composition of the light itself, that is, the kind of radiations, there are no artificial light sources which are the same as daylight. It does not necessarily follow, however, that they are not therefore equal to daylight for most purposes. It is by no means essential that we have all of the different kinds of rays, that is, light of the same color as daylight, for all purposes. In not a few cases it is general practice to shut out the daylight, and use artificial light instead; as in theaters and often for social gatherings. Daylight contains a much larger proportion of the ultra-violet rays than is found in most artificial light sources, as is shown in the phenomena of sunburn and snow-blindness. The eye can see with the least effort by greenish-yellow light, such as that emitted by the firefly, and practically all commercial light sources are richer in rays of this color than in any other. The only absolute necessity for white light is to judge of colors which are to be seen by daylight; and light of this quality can now be produced artificially at a not prohibitive expense.

Instead of all of the color rays in their daylight proportions being necessary to the best visual results, it is easily demonstrated, both by theory and practice, that the elimination of both ends of the spectrum, that is the violet and red, can be made with actual benefit to vision. In other words, the eye can see fine details with greater ease and accuracy by light of greenish-yellow hue, than by white or sunlight. This is due to a physical property of the lens of the eye, which cannot sharply focus all of the different colored rays at the same time; hence, when only those rays which are most effective in producing vision (the greenish-yellow) are present, the eye can focus with greater sharpness, which means more power as well as more distinct vision. Some artificial lighting actually surpasses daylight for cases in which the eye is called upon to see very small objects, or resolve minute details. While daylight and artificial light differ in point of composition, daylight has no essential advantage from this.

In point of steadiness, artificial light is the superior of natural light, for it not only can be produced free from flicker or wavering, remaining constant from hour-to-hour, whereas daylight is scarcely constant for two successive minutes.

Summing up the comparison of physical characteristics, we find that there are no respects in which daylight may not be equaled by artificial light, and some in which it may be excelled. The rules for accomplishing this are, furthermore, extremely simple. First, have enough light. Second, have it completely diffused, with the light sources themselves hidden. Third, provide special light where colors must be seen by their daylight value. Or, to condense all of these into a single direction: *Fill your whole factory full of light, just as nature does, and your lighting problem will be solved.*

[Continued from Page 5.]

PROCEEDINGS, NINTH ANNUAL MEETING, IOWA DISTRICT GAS ASSOCIATION.

Held at Burlington, Ia., May 7-9.

Second Day—Morning Session.

The convention was called to order by President Fair in the dining hall of the steamer "Morning Star," en route to Keokuk, Ia. Mr. A. E. Keller read the following

Report of Standing Committee on Manufacturing.

Burlington, Ia., May, 1913.

The progress made in a single year, in an established industry such as ours, cannot show radical changes. Gas manufacture has, however, been improved by the use of more exact methods, and increased attention to economy in all departments. The high costs of labor and materials, coupled with rate reductions, have necessitated the adoption of the most efficient methods, labor saving devices, and improved machinery. Greater returns are being secured from the recovery of by-products than ever before. On the Pacific Coast steps have been taken to further the study of gas manufacture, by establishing scholarships in the Universities similar to that in the University of Michigan. Gas Associations elsewhere are also taking steps in this direction.

The heat unit basis has been urged and advocated by many, including the Bureau of Standards, which recommends that a gas of 600 B.T.U., gross heating value, with 16 candle power coal gas, or 19 candle power water gas, is a reasonable regulation. In London one company's standard is 540 B.T.U. gross, with a penalty only on a lapse to 475 gross. In Paris all candle power requirements were abolished in 1911, the present requirement being 522 B.T.U., net. In Berlin they have a requirement of 543 B.T.U. gross, with a minimum ef 522. In Buenos Ayres, a company was recently granted a franchise on a net heating value of 539.4 B.T.U. net.

The Bureau of Mines has conducted investigations and published bulletins bearing both directly and indirectly on gas manufacture, tending toward a more economical use of fuels and utilization of the cheaper grades. Among these bulletins are "Transmission of Heat into Steam Boilers," "Coals Available for Illuminating Gas Manufacture;" investigations on gas producers, also others dealing with the sampling and testing of gases, coals and oils. Experiments have been made upon the coking qualities of Illinois coals, and on the carbonization of coals at low temperatures. The rapid increase in the number and size of by-product coke oven plants points to a more general construction of large plants, in favorable localities, for supplying enriched gas, by high pressure, to small towns within a reasonable radius.

In water gas manufacture much attention has been paid to the utilization of the waste heat of the blast gases and the heat in the illuminating gas; and when it is shown that for each 1,000 cubic feet of gas made, 62,400 B.T.U.'s are in the blast gases and 48,230 in the illuminating gas, it seems a favorable field for experiment. Waste heat boilers have been perfected and are operating satisfactorily in many plants. Turbo-blower sets are gaining in favor because of the higher speeds obtainable than with most motor-driven sets, and because engine sets waste steam and space, and bring belt troubles. Blast pressures are raised higher than ever before, the average being 21 inches water gauge with a maximum of 40. The higher blast pressures and shorter the blasting period increase the capacity of the generating equipment.

Installations of vertical retorts have been made and, in general, show a saving in labor and an increased make over horizontals, with a slightly lower candle power and calorific value.

The coals available for gas manufacture show, in many cases, an increased sulphur content, and much has been done to determine the purification methods and materials best adapted to them.

Tar is used as fuel in many places with satisfactory results, and many smaller plants are using concentrators in the recovery of ammonia.

Both coal and water gas tar are finding wide uses as wood preservatives and road binders. Some gas companies are distilling their tar and finding a market for the most of their products at home. Water gas tar has been used with excellent results for washing gas for naphthaline removal. In some places the oil used for carbureting purposes is used for naphthaline washing, and then later in the water gas machine. The greater part of the naphthaline is recovered in the water gas tar, while the naphthaline in the gas is increased over the ordinary amount by but a fraction of 1 per cent. Diesel engine, using tar oils, is one of the important inventions of recent years. It has a wide use in Germany, and is extending its field of operation greatly. It is claimed that this engine, and engines using gas from a coke breeze producer, are the cheapest sources of power. The past year has shown a tendency toward coal gas, and the establishment of by-product coke oven plants. Efforts have been made to produce a low candle power gas of about 550 B.T.U.'s gross heating value, but definite steps toward the adoption of any of those methods have not as yet been taken.

In general the gas industry has shown a healthy growth in every department; with every indication of a continued growth with the application of newer and better methods of manufacture.

E. W. Eustace,
H. J. Carson,
A. E. Keller,
} Committee.

The report having been accepted, Mr. G. I. Vincent said he understood that the Bureau of Standards had decided on total heat value, dropping gross and net, which seemed a logical and scientific conclusion. He did not quite get the committee figures on the stack losses in a water gas machine, but the heat balance of the machine

showed that, of the total heat given to the machine, about 10 per cent. escaped in the blast gases and about 5 per cent. went off as sensible heat in the illuminating gases. With waste heat boilers, however, about two-thirds of this could be utilized.

The President then introduced Mr. E. C. Weisgerber, who read the following paper, entitled

RECENT DEVELOPMENTS IN INDUSTRIAL FUEL APPLIANCES.[1]

Some years ago Prof. C. W. Siemens made the statement that the time would come when the use of crude fuels, such as coal, coke, etc., would be simply barbarous; that nothing but gas would be used as fuel. Since this assertion was made, wonderful strides have been made along these lines, and the wideawake gas man knows and feels that the quicker our companies abandon the old and occupy the new and wider fields, the greater will be their prosperity. We have known for years the superiority of gas as an illuminant; but its far greater importance, as fuel, has not been fully realized. Gas has brought comfort and convenience to our homes by introducing ranges and water heaters, house heaters, etc., and has made rapid strides to abolish the coal bin and the ash pit, besides greatly lightening the work of the housewife. Hardly a modern home is now built with a coal range, and at present the heating of the entire house, using gas fuel in the furnace, is rapidly developing. This is a wonderful field; but there is still a greater field, that of utilizing gas for industrial fuel purposes. Years ago it was considered impossible to use anything but coal for industrial fuel purposes; then came oil; now comes gas. There is no greater field, with better prospects, than the industrial fuel field, and though we may not all have manufacturing cities, there is always some field for industrial gas. Forging, melting, annealing, hardening, tempering, japaning, etc., must be done wherever metals are transformed into merchantable wares, and in every case gas can be used to better advantage than coal. There is no easier way. There is no other fuel which will give the regulation or will turn out the efficient and accurate product that gas will.

The use of gas for industrial purposes has shown tremendous strides in the past few years, and there is nothing small or large that the industrial gas man has not been successful in handling.

Some years ago gas for industrial purposes was confined to the use of atmospheric burners, and the gas blast furnace of the present day is one of the interesting examples of the superseding of former methods. These are designed for heating processes which require perfect control and even distribution of heat, and have given better and more uniform results, increased productive capacity and improved the quality of the product by cleanliness, convenience and reliable operation. What is true of the gas blast furnace is also true of gas blast forges. These work quickly, evenly and with little or no scale. The degrees of heat required is developed in a few minutes, and they are always ready for use. The over-heating of stock is absolutely prevented; and properly heated stock is supplied as quickly as it can be handled, which is advantageous, far outweighing any possible saving in mere fuel cost. Case hardening, with the uniformity which is essential, cannot be done with coal, but can be done with gas.

A short time ago the National Commercial Gas Association issued a booklet called "A Thousand Uses For Gas," and it would make a very long list should we rewrite it here. But as there are always new uses which are of more than ordinary interest I will take a few moments to go over a few. One of the fields is japaning, baking and drying in a large way, replacing the process of using steam or coal and coke. It was two gas installations at the Ford Motor Company's plant in Detroit that paved the way for the Detroit Gas Company to large deals in the history of the gas business. The ovens were 20 feet long, 18 feet wide and 9 feet 6 inches high, and now there are 6 of them working 24 hours per day using artificial gas. The General Electric Company has 30 ovens ranging in size from 18 feet deep, 16 feet wide, and 7 feet 6 inches to 4 feet by 4 feet by 4 feet, drying armatures, coils, and japanning cast and sheet metal parts, ranging from 150 F. to 600° F. In Grand Rapids, Mich., there are ovens 22 feet deep, 10 feet high and 10 feet wide, and in Cedar Rapids we have one installation of 30 feet long, 6 feet wide and 7 feet high. The industrial fuel man is japanning anything from automobile bodies down to eyelets, hairpins and buttons. There are now made all kinds of rod heating and metal heating furnaces, designed for special material. We have all kinds of forges and the United States Mint is using gas only for melting and annealing, etc. Everything is now being handled, running from steel writing pens to large pieces of machinery. Tinning, etc., is now being done with gas, and with better efficiency than with other fuels. I know of one installation of the latest model of tinning furnaces, which have been replaced by gas, and instead of three attendants, as heretofore, there is now only one, and he is turning out more work and better work than 3 men did before the installing of gas.

One of the most interesting of the recent installations and one of great interest is the new process of carbonizing by gas, in which bone or other solid carbons are eliminated. Another development is the automatic heat controller and regulator, which is helping wonderfully in the industrial fuel field. Another is the new process for obtaining carbonia, or gun metal finish, on iron or steel. In this process no chemicals are used, and it is simply a heat treating operation with the proper oxidizing elements. The fuel in this process must be under perfect control, as a variation of temperature is likely to change the color of the material. Gas fired steam boilers are used in vulcanizing plants, in newspaper offices for matrix tables and space heating; engine houses, bakeries, knitting mills, etc. In fact, a gas fired boiler has so many advantages that every town, no matter how small, has some prospects.

The field for water stills is unlimited, and the time will come when every office building, hotel, college, home, etc., will have its own still. There has been some wonderful improvement in atmospheric burners. I know an installation in a newspaper office of a pot holding 18,000 pounds of metal. Under this pot are 54 burners and it takes 1¼ hours to bring 18,000 pounds of stereotype metal to 620° F., using 2,646 cubic feet of 620 B.T.U. gas, or 14.7 cubic feet of gas per 100 pounds. I know of another installation of a 16,000 pound furnace having 42 burners, taking 12.8 cubic feet of gas per 100 pounds, and still another of 12,000 cubic feet capacity, which averages 10½ cubic feet per 100 pounds of metal. Atmospheric burners can be used very advantageously for some industrial purposes.

In still another installation where there are 6 brass melting crucibles furnaces, one of which will burn 360 cubic feet of gas per hour, and give a temperature of 2,100° F. inside an empty crucible in 30 minutes. This furnace melted 140 pounds of brass in 1 hour.

In a candy factory it took formerly about 2 cubic feet of gas per pound of a given kind of candy, now it takes, with the right kind of furnaces, but ⅓ cubic foot per pound. I know of one factory, in a city of 35,000 inhabitants, which has 14 gas-fired furnaces, 3 large peanut roasters, 12 batch heaters, 7 water tables, 12 chocolate cookers, also marshmallow and cream boilers, all with gas, or gas-fired steam boilers. Gas is also used to fire the sawdust and wood for smoking meats. I know an installation of 22 smoke houses each having a capacity of 2 carloads. Another notable installation in which gas is used in special constructed furnaces, is for cooking wheat and rice, making the well-known puffed wheat and rice. One gas company, in a city of 35,000 inhabitants, has just closed a deal with a concern to furnish them 6,000,000 cubic feet of gas per month, with prospects of increasing this to 10,000,000 cubic feet within a year's time.

There is no city too small to have a few industrial fuel prospects. It only needs the getting and convincing of the manufacturers. There have been wonderful developments and continual improvements. At the present writing there is scarcely a business that cannot use gas in some way.

Before closing I would like to make a few remarks about industrial business proper. Though this field is a large one, the main thing a gas man must bear in mind, is what the real needs of the prospect are; what he is doing and what he ought to do. Then the right kind of furnace to do this with. Next the right kind of installation, made under the proper conditions, to enable the gas man to demonstrate what gas can do. It is not necessary to have a high priced industrial fuel engineer on the ground. Some good commonsense, mixed with a little mechanical knowledge, is all that is needed. Don't install a furnace because the manufacturer says it is good; but know that it is good. Be sure you have the right thing, so that you do not fall down. One mistake will do more harm than the good of a thousand successes. The field of gas engines is now being heavily exploited, and is unlimited; representatives of gas engine concerns are pleased to give information, and assist you in placing engines. All of the above will lead to success and will help forward the day when the statement that it is "barbarous" to use crude fuels will be realized.

Discussion.

Mr. E. H. Martin—I deem it wise, in going after industrial business, not to give the concern you wish to do business with too big a

(*Continued on page 26.*)

1. Slightly abridged.

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NEW YORK, MONDAY, JULY 14, 1913.

BRIEFLY TOLD.

A Splendid Presentation, by President Alex. C. Humphreys.—We are in receipt of a pamphlet containing the words of a paper (its titling really should be that of lecture) prepared by Dr. Alexander C. Humphreys, President, Stevens Institute of Technology, for the Minneapolis meeting (June 24 to 26) of the Society for the Promotion of Engineering Education. The dates show an excellent reason for the absence of the Doctor from the June meeting of the British Gas Institution, at which conclave he was slated to read a paper; and while we know that our English brethren regretted his absence, we also are glad over the fact that his presence in Minneapolis brought forth such sound cultivation in the fields of thought as that evidenced by him in the paper under consideration. Those who have known the Doctor, for any length of time, know that he is qualified to give chapter and verse for his statements, since, in the collecting of such chapter and verse, he has "farmered" well, broadly and deep in the fields of experience, to the end that the fruition of his thought and action is that which was gained through fertilization by hard labor; but labor well-directed. He comes from a family of "schoolmaster-students," some of his closest relatives having put in long-time, good service as tutors; nor was his own tuition gained without positively strenuous work on personal account. But the situation of his youth did not preclude him from personal pertinacity in the acquirement of that which is often termed book lore. In his day, the question was not, shall it be a 3, 4 or 5-year course. Indeed, no; the question in reality was, "How speedily may I acquire the foundation of theory so that I can commence construction through practice?" That he worked speedily and well would seem borne out by the record. Having the splendid fortune of being taught by one who was easily the dean of the engineering professors of his long and grandly productive career (the late Doctor Henry Morton) that he learned worthily and well that he now directs the noble institution (the Stevens Institute of Technology) founded by that member of the Stevens family whose name will live while the practice of engineering is pursued, from which he derived his initial or theoretic training. Perhaps, though, this is altogether too personal, as introductory to the merits of a recent paper by Doctor Humphreys; but it seems germane, in that it in homely way attests when he wrote he thought from the book of personal experience. His subject had to do, as he expressed himself in the first paragraph, "* * * I shall confine myself to collegiate education in preparation for the profession of engineering." And he does so confine his text largely devoting himself to exposing the almost fallaciousness of the argument that the present term or course of 4 years is altogether too short. To quote from the opening paragraphs: "* * * Have the colleges of engineering at any time in their history given their students a complete training for life's work and responsibility? The question needs only to be asked to be answered in the negative. The college training in engineering is of great value to the one who takes advantage of his opportunities. The college affords the opportunity for acquiring a sound *fundamental* training within the shortest time and with the least expenditure of mental and physical energy; but this college training is not a necessity in the case of the men, perhaps exceptional, who have the brains, physical strength and determination to persist in the face of difficulties. Let us not forget that, in every walk of life, there have been, and are now to be found, men in the front rank who never had any college training, and some who had little school training. It is true these were or are extraordinary men, and must not be taken as patterns in planning for those of average capacity. But at least we can learn from the careers of these men that education can be obtained outside of academic surroundings. Then, should not the man of good ability and character be able to study effectively by himself after 4 years in college, following the years spent in the grammar, primary and high schools. Certainly he should be, provided he has been taught how to study and reason, rather than crammed with facts and information. * * * Are not we of the engineering colleges too apt to be led astray by thinking that we must turn out a finished product? Is it not true that too many educators believe, or at least act as if they believe, that all education is to be secured only within the school, college and university? A great many believe, or act as if they believe, that all culture must be so secured. * * * The college may develop scientists, but it remains for the school of experience to complete the training of the engineer, as far as it can be completed." And, while decrying or opposing an extension of the theoretical training time, not a word other than in support of theoretical training may be noted. If, according to the present-day advocates, the student days are to be lengthened, so the span thereof will be doubled over that ruling a generation ago, youth will not be the physical characteristic of those who are entering the field of practical engineering. No; rather will the aspirant for fame in such field be mature (in years) rather than adolescent. Scientific endeavor requires draymen as well as drivers; and, under the circumstances, the reins of thought, as exemplified in the Doctor's sentences, seem those surest to lead to new goals over safe roads.

American Retort Materials.—In the discussion of the Report of the Refractory Materials Committee, when delivered to the recent meeting, in London, of the Institution of Gas Engineers, Herr Körting commented on what he had seen in the United States. He said that he was struck by the large extent to which silica material had been adopted. They have made a perfect revolution with regard to coke ovens. The ordinary time for coking an oven used to be about 30 hours, but since they had adopted silica material, the time of working had come down to 14 hours or 15 hours, the temperature being raised correspondingly. He had seen in the Astoria Gas Works, New York, retorts made in sections, one retort being in four or five pieces; and these retorts had kept their form absolutely for three years, under temperatures ranging from 1,100° to 1,300°. The retorts were built up leaving a small space between the pieces, and this space was filled in with a thick paper gasket. When the setting was put in operation the paper burned out, and the sections expanded, the retort keeping its form perfectly. He thought that silica material might also be adopted on this side of the water, considering that silica could sustain a temperature of 1,900° C., against 1,500° C. for ordinary materials. The prospects of carbonization would be enormously changed for the better, if they could use the high temperatures possible with silica material; and, therefore, he thought it was worth while that the whole gas industry should study this question closely, and see whether the material would be as successful here as it is in America.

The President (Sir Corbet Woodall) said that Mr. R. M. Searle, of Rochester, N. Y., knew a good deal about this matter, and he hoped he would say a few words. Mr. Searle said he felt dignified by being able to appear before such a distinguished institution, and particularly upon being able to bring before the "gang," a suggestion that might be of benefit to everyone engaged in gas making. He might say they would get the best information if they delayed their studies until the October meeting of the American Gas Institute, when the Carbonizing Committee of that Institute would report on the silica material used in the States. His colleague, Mr. Russell, who was now touring Europe for information on the vertical retort question, made a 3 months' tour with him, in the States, studying coke oven and horizontal retort practice. The work done by the silicate material did not end with the material itself. In America some are now working up to 95 per cent. of silica content, and the material is marvellous in its effect on the quality of the gas and the amount produced. They are able to make a better coke in fourteen or fifteen hours with 15-ton charges, than they formerly could in thirty hours with 10-ton charges; while making a better grade of gas, tar with much less free carbon, and a better coke for metallurgical purposes. The gas company in the States that was the first to use silica material got results so astonishing that American engineers were beginning to have suspicions. Having seen the evolution which has taken place, he was beginning to feel that if he should adopt the vertical system, they would put in a number of settings made of silica material, for their own information, and for the information of the industry generally. The temperatures and abuse this material would stand, and the character of the material generally, were diametrically opposed to what one would expect. Having been for years engaged in the testing and studying of refractory materials, he would have said that silica was altogether useless for retort practice. The silicate retort pieces or sections that Herr Körting had spoken of, could be crumbled in the hand, and yet retorts of this material had taken the jolt and jar of machinery in horizontal and inclined practice for three years. The tests of the American Gas Institute would cover the whole of retort practice, and would, he thought, determine decisively whether there was increased conductivity, or radiation, or both, by this method of working. Of course, the conductivity was very rapid

and very efficient with the silica material, and the heat was applied much more efficiently to the coal during the carbonizing period, and they were now able to run horizontal retorts entirely full, where formerly they could only run them two-thirds full.

MID-SUMMER MEETING, NEW JERSEY STATE GAS ASSOCIATION.—We are indebted to the courtesy of Secretary and Treasurer O. F. Potter, of the New Jersey State Gas Association, for the information that there will be a meeting of the named body at the Metropolitan Hotel, Asbury avenue, Asbury Park, at 10:30 A. M., of July 23rd. It is planned to have a short session, at which subjects, pithy and to the point, will be discussed. A demonstration of the Pulmotor is also on the cards. The morning session will conclude at 12 o'clock, after which the members of the Association will journey to Port-au-Peck, there to partake of one of Wardell's famous clambakes, at 1:30 P. M., as guests of the Association. A good programme has been arranged preliminary to the "bake," the listings including baseball and other sports. President Butcher, joins the Secretary and the Committee in the lively hope and belief that a goodly number of guests, as well as members, will be in attendance at the midsummer meeting. A general invitation to be present is extended to everyone.

THE OFFICERS OF THE ILLUMINATING ENGINEERING SOCIETY.—At the recent election of the Society the following officers were elected, for various terms, beginning October first, 1913: President, Charles O. Bond; Vice-Presidents, George H. Stickney and Ward Harrison; Gen. Sec., Joseph D. Israel; Treasurer, L. B. Marks; Directors, F. J. Rutledge, C. A. Littlefield and F. A. Vaughn. Messrs. Israel and Marks were re-elected to their respective offices. Mr. Bond, the President-elect, who is well known to the gas fraternity, is a native of Lehigh, Webster County, Iowa. Graduating from the U. S. Naval Academy (Annapolis, Md.) in 1890, he served one year at sea in the U. S. Vessels, "Enterprise" and "Philadelphia," and resigned from the service in 1891. Later he taught in various schools in Iowa and New York, and in 1897 became attached to the home offices (engineering division) of the U. G. I. Company. In 1898, during the period of the war with Spain, he served for some months as an Ensign on the U. S. vessels the "Lancaster" and the "Newport." At the close of hostilities he resumed his connection with the U. G. I. Corporation, taking charge of its photometric work. His work in this connection is amply attested by two excellent papers on Photometry and kindred matters submitted to the American Gas Institute. While continuing this work he also had command of a division of the naval force of Pennsylvania for 3 years. Since 1909 Mr. Bond has been Manager of the photometric laboratory of the U. G. I. Company, a service that is not excelled by any other in the world. He was a charter member of the Society, serving it one term as a Director and another term as Vice-President. He was the American delegate to the Photometric Commission (Zurich, 1911), and is a member of those Societies: American Gas Institute; Franklin Institute, National Commercial Gas Association, and the British Illuminating Engineering Society.

THE PITTSBURGH CONVENTION, ILLUMINATING ENGINEERING SOCIETY.—We are indebted to the courtesy of Mr. J. C. McQuiston, Chairman of the Advertising and Publicity Commission, for the knowledge that it has been definitely decided to have the headquarters of the Society (Sept. 21 to 26) in the Hotel Schenley. As he remarks, this is a particularly happy selection, in that, apart from its completeness as an abiding place, the Hotel is within easy walking distance of the Carnegie Museum and Library, the magnificent Carnegie Technical Schools, the University of Pittsburgh, several prominent Clubs and the Soldiers' Memorial Hall. The latter will prove of especial interest to illuminating engineers on account of the wonderful lighting effects obtained, which are said to be unequaled in any other structure in America. The programme, as now outlined even, covers an exceedingly interesting set of papers on several subjects pertaining to illumination. In addition to the technical sessions of the Society, the local committee has arranged for a series of entertainment features, in which the gentler sex has been fittingly remembered. The features include automobile rides, theater and card parties, golf, tennis and baseball—the latter, of course, for the sterner sex. The crowning number (a banquet) is reserved for the "finish;" and it is quite certain that the diners will have served to them several innovations—these for the benefit of the aforesaid "S.S." Inspection trips have been outlined for several points, and include visits to the Westinghouse Electric Manufacturing Company, the Carnegie Steel Works, the Macbeth-Evans Glass Company; also a luncheon, at the plant of the Heinz Company—the home of the 57 varieties. Many things will likely be dispensed here, that will "Look through a glass darkly!" The papers scheduled include these subjects: "The Quartz Light: Fontaine and Neon Tube;" "Church, Factory, Store, Hospital and Street Car Lighting;" the "Present Commercial Development in Several Forms of Lighting;" "Errors in Photometric Measurement;" and the "History of Artificial Lighting." In addition, many other themes will be considered by authors well known to the engineering profession in illuminating as well as other fields. The development of the new flame carbon arc lamp will also be discussed. An interesting feature in connection with the technical sessions will be the holding of symposiums concerning various general subjects, to be led by those particularly well posted in respect thereof. These sessions will afford opportunities for free and open discussions that would probably not occur in more formal assemblage. A Transportation Committee has been appointed, consisting in part of the Secretary of the local section in each city, the duties whereof will be the perfecting of arrangements for the members and their friends in obtaining transportation to and from Pittsburgh.

A CONCISE ACCOUNT OF A SAFETY RALLY.—For several years the United Gas Improvement Company has taken a leading part in accident prevention work and first aid treatment. Mr. J. B. Douglas, Manager of the Claim Department, has been distributing signs, placards, buttons and other reminders to workmen of the duty they owe themselves, their fellow employees and the Company. He also felt that a mass meeting in the interests of safety would prove of value in the work. Invitations were, therefore, issued to all works in the vicinity of Philadelphia, to attend a "Safety Rally" in the Philadelphia Y. M. C. A. Auditorium, the night of the 30th ult., at which addresses by men distinguished in accident prevention work were delivered, and motion pictures shown dealing with the subject. In spite of the uncomfortable weather, over 500 (the capacity of the hall) were in attendance. Mr. Douglas struck the keynote of the rally, when, in his introductory remarks, he said: "We hear much nowadays about first aid; but, while first aid is important in its place, our first duty is to avoid conditions making first aid necessary—to eliminate the cause of accident. As most of you know, this Company has for years been doing its best to make the conditions under which its men work as safe as possible. Accidents are bound to happen wherever men are employed. Many of these accidents are preventable, however, and we feel that by bringing the subject of safety before you, as we are doing this evening, a great deal will be accomplished toward reducing preventable accidents, and making the others less serious." In addition to Mr. Douglas, the following addressed the meeting: Mr. F. W. Keough, Editor, American Industries; Mr. W. J. Serrill, Engineer of Distribution, Philadelphia Gas Works; Dr. W. H. Tolman, Director, American Museum of Safety; Mr. W. H. Gartley, Engineer of Works, Philadelphia Gas Works. Mr. Keough, whose subject was "Motion Pictures in Accident Prevention Work," gave some startling figures relative to the annual toll, in lives and money, taken from the industrial field by the carelessness, indifference to danger of employees and their willingness to take chances. The toll on this account cost 30,000 lives lost last year, and the financial loss in fatal and nonfatal accidents amounted to the astounding figures of $250,000,000. Mr. Serrill called attention to the fact that tendency to carelessness is a weakness in most men and women. While willing to acknowledge the value of care in the abstract, they are not sufficiently interested to practice it in their vocations. Even in occupations regarded as hazardous, familiarity with the risk seems to breed contempt, and the carelessness of persons so employed is a matter of remark. Dr. Tolman, with whose name accident prevention is synonymous, covered the subject of "Safety First." He placed especial emphasis on the training of children in the safety habit at an early age, the habits formed at this time making the deepest impression on the relationships assumed later in life. Training in industrial schools he regarded as of great value to the growing child. He gave instances of what had been done in New York city along those lines, and what it is hoped to accomplish in the next few years. Mr. Gartley spoke of co-operation between the Company and its employees, the Company bearing a portion of the expense by contributing part of an injured employee's wages, in order that his anxiety may be lessened and his return to his post of duty hastened. In doing this, the legal liability of the Company is not taken into consideration, but it is an effort an the part of the Company to keep every man at his post of duty, and in the best possible condition. As the men were leaving the hall, "Safety League Buttons" were distributed by the ushers. While the Safety League is merely an informal organization for the purpose of furthering safety, it has been so well received than an elaboration of the idea is now under consideration. The addresses were well received, and the motion pictures, carefully selected to illustrate the lessons they were intended to portray, made a very favorable impression. It is hoped that the coming year will show results, in suggestions from employees, of methods that will reduce industrial loss through preventable accidents. For our report of this we are indebted to the courtesy of Mr. J. F. Conner.

CURRENT MENTION.—

THE next meeting of the British Institution of Gas Engineers will be held in Liverpool, England, with Mr. Edward Allen (Liverpool) as President, and Mr. John Young (Hull) as Vice-President. With such a pair of leaders in the fraternity of gas engineers, the success of the 1914 meeting is assured. The Institution met in Liverpool 35 years ago.

WITH much regret we report the death (in Halifax, England, July 4th) of Mr. J. Armitage Drake, the active head of the well-known gas works' constructing firm of Drake's, Limited, of Halifax. Deceased, who was in his 66th year, was well-known through his frequent visits to America, and notably from his active supervision of the huge undertaking in the construction of the Consumers (Ontario, Canada) new plant some 2 or 3 years ago. We have in preparation some account of his useful career.

ON October 1st to December 31st, 1914, the rate that may be charged to users of gas by the Brooklyn Borough (Coney Island district) Gas Company has been fixed by the Public Service Commission, at 95 cents per 1,000, a concession of 5 cents. At this figure the Commission asserts that the Company can ersily earn ove r 6 per cent. on its capital stock.

(Continued from page 23.)

dose of gas at once. For instance, suppose the man you talk with cares for the manufacturing end of the concern, and you enthuse him to the point where he is ready to take gas for anything and everything. Possibly his ideas are right, but the men he represents are watching the dollars, and they haven't practical knowledge as to what they will receive for the increased outlay. I find it is best to give them gas in small doses, until you get the maximum amount of gas in their institution. We had an experience with a newspaper office which was talking about $300 worth of gas a month. The owners were anxious to have us take over a melting pot with a capacity of something like a ton; but had we done so it is a cinch we would have lost $300 by it. As it is, we will enjoy that $300 right along, if we don't overload them.

Mr. Phillips—My experience is similar to that of Mr. Martin. In going after industrial appliances it is first necessary to show a man that the use of gas will benefit him; that, although it may cost more than the actual coal consumed, the results obtained by using gas would more than offset such increased cost; and salesmen should be very particular to bring ont that point. Once prove this to him he is bound to come back for more. One experience with lead melting for a paper, through being too enthusiastic at first, lost us the entire business. We should first have gone after the small appliances in the office, such as matrix work and the steam generator. Then we might have gotten the melting pot. The trouble was, going after the largest thing first, we fell down. You must prove to the manufacturer that you have something that can cause him to turn out the material bethan the system he is using. He does not fear increasing his operating cost if he can increase his product or make better material than his competitor; and he can do so by using gas.

Mr. Weisgerber—Having once convinced a man that he can do a thing better and cheaper with gas, he is only too willing to use it. The only drawback is the initial cost of the installation. Industrial appliance concerns all over the country are only too anxious to send their products on 60 days' trial, to let you demonstrate what you can do. So, if you cannot make them stick, you are out nothing except the gas used. Our "Quaker Oats" factory had a producer plant of about 2,500-horse power, and nearly every large industrial consumer that we tried to hook up said if they used gas in large quantities they would prefer to put in a producer plant. We had to show them that on one furnace we were able to give efficiency. We spent 6 weeks getting the right burner, and when we did find it, and showed them what we could do, they were willing to let us try on 4 batteries, then on 16, with the understanding they would use artificial gas only, provided they could get service from us if they should triple their capacity. We are now figuring with one of the other oatmeal mills, on a dryer, which uses about 3,000 tons of coke a year. They want to use a table 90 feet long and 20 feet wide, and we are trying to get a burner to take the place of this coke for heating it.

Mr. Martin—What is your rate to a consumer who uses $600 worth of gas a month?

Mr. Weisgerber—We sell gas in Cedar Rapids for 90 cents, and have a rea diness-to-serve rate by which we make a fixed meter charge. On one type of meter we make a charge of $2.40; on another, $3.80; on the third, $5.80. We install sufficient meters to take care of his maximum daily capacity, and he pays the fixed charge. The gas is billed at 80 cents gross (75 cents net) for the first 25,000. The second 25,000 at 70 cents gross, 65 cents net; the second 50,000 at 70 cents gross, 60 cents net; everything over 100,000 is billed at 65 cents gross, 55 cents net.

The President then called for the paper by Mr. F. P. Kelsey, of Chicago, on "Advertising." [The "copy" for this was not forwarded us.—Eds.]

The convention thereupon adjourned for luncheon, and upon arrival of the steamer at Keokuk the members and guests were conducted through the plant of the Mississippi River Power Company. Returning to Burlington in the evening, the members enjoyed a banquet on board the steamer.

Third Day.—Morning Session.

The President having called for order, the Secretary read the following letter, from Mr. W. R. Addicks, Chairman, Committee on Gas Congress:

New York, N. Y., April 23, 1913.

Mr. C. W. Fair, President, Iowa District Gas Association, Atlantic, Ia.—Dear Sir: At the annual meeting of the American Gas Institute, held in Atlantic City, N. J., October 16-18, 1912, Mr. Edward C. Jones, Chief Engineer, Gas Department, Pacific Gas and Electric Company, San Francisco, Cal., as the Representative of the President of the Panama-Pacific Exposition, and as the Special Representative of the Pacific Coast Gas Association, invited the American Gas Institute to appoint a Committee on Gas Congress, to be held in the city of San Francisco the week beginning September 27, 1915.

In accordance with the said invitation, and by authority of the American Gas Institute, the President, Hon. Ira C. Copley, appointed a Committee on Gas Congress.

I now, therefore, have the honor, in the name of the Committee on Gas Congress, to invite the Iowa District Gas Association to participate in the said Gas Congress, in the city of San Francisco, the week beginning September 27, 1915, and respectfully suggest that the Iowa District Gas Association appoint a delegate to meet and co-operate with the Committee on Gas Congress, in a united effort to make the Gas Congress, historically, the most representative of any gathering ever held, of men interested in any and all phases of the gas industry throughout the civilized world.

The President—Of course, it is out of the question for the Association to meet in San Francisco. What is your pleasure as to a representative of this Association to take part in the Gas Congress?

Mr. Kennedy—In view of the fact that Mr. Clabaugh is a past-President of the Association, and at the head of one of the largest gas companies in the district, I move that he be elected our representative to the Gas Congress.

Mr. Vincent—I wanted the pleasure of making that motion myself, and I would like to second it. [Motion submitted and unanimously adopted.]

Response of Mr. Clabaugh.

Mr. Clabaugh—Mr. Chairman and gentlemen: I cannot tell you how greatly I appreciate this honor, for it is an honor. You had previously given me the greatest honor that the Association could confer upon any of its members, by making me your President. When my term of office expired I stepped into the ranks, and meant and mean to be as loyal a soldier with the musket men as I was when I carried the sword as an officer. What you have done this morning affected me greatly, for I take it, gentlemen, that you have done this because you wished to do me a kindness.

Telegrams of Regret.

The Secretary read telegrams of regret from Messrs. George W. Waring, S. A. Winchell, A. B. McCarton and B. C. Adams.

The President introduced Mr. G. W. Clabaugh, who read a paper on

THE WELFARE OF THE EMPLOYEE.

This being a subject admitting of many interpretations, I propose to accept the simplest and, to my mind, the most practical side of the question, the value of a satisfied and happy employee to his employer.

As all business enterprises should be based on sound and practical principles, it necessarily follows that it is wise to cultivate in employees a spirit of goodwill toward their employers, so that they will take an interest in the work assigned them; for no man can do his best if his surroundings are not what they should be. It is the duty of the employer to cultivate in the employee that spirit of responsibility in his share towards the successful operation of his business, and not make him think that he is but a machine, without thought or feeling. He should be encouraged to use his brains in all of his work, for oftimes many good suggestions towards greater efficiency and economy might be brought out which otherwise would be lost. All business depends upon the employee, for no matter how progressive and industrious the employer may be, he must depend upon others to carry out his ideas; and the more efficiently this is done the more valuable the employee becomes. He should receive fair wage, not only that he may better care for his family, but, more particularly, that he need not be worried over financial difficulties that might unfit him for giving his best at all times; for no man can do good work or rise to emergencies if his mind is diverted by outside matters. He should be able to give his best at all times, and, so doing, the good will revert to his employer. It is, therefore, self-evident that, not only from a humanitarian standpoint is the welfare of the employee one of the greatest factors in business success, but, in a more homely phrase, it pays. If the employers of large bodies of men would give more time and thought to the welfare of their employees, there would be few disturbances by strikes and other methods employed by the laboring men to secure the rights that are due every man.

When one erects a building his first thought would be as to the stability of the foundation; how much weight it will carry; how the winds will affect it, before he builds upon it, and one hundred other things that might weaken it. For the strength of the whole is dependent on the solidity of the foundation. If no thought is given to this, a beautiful structure might be erected on the sands; but when the storms come and the waves beat upon it, it falls to the ground; but when the foundation is built upon the rocks, the winds and storms may beat upon it, and it will stand. We may liken the satisfied employee to the foundation upon the rocks or the sands. It, therefore, behooves us to care for his welfare if we expect to reap the reward of honest labor. Men should be treated as men, not as menials, and merit should receive its reward. I do not mean that men should be coddled; far from it. But I do believe they should be given a square deal, and that only, and I cannot better express this idea than by quoting from the Bible, "Do unto others as you would have them do unto you." Put yourself in his place and you will know how he should be treated.

Men who work conscientiously and give to their employers for years the best that is in them, should be made to feel that, when old age comes, and they are no longer able to work, then, as a just reward for their life time of labor, they will be cared for by their employers during the remainder of their lives, that peace and happiness may be theirs.

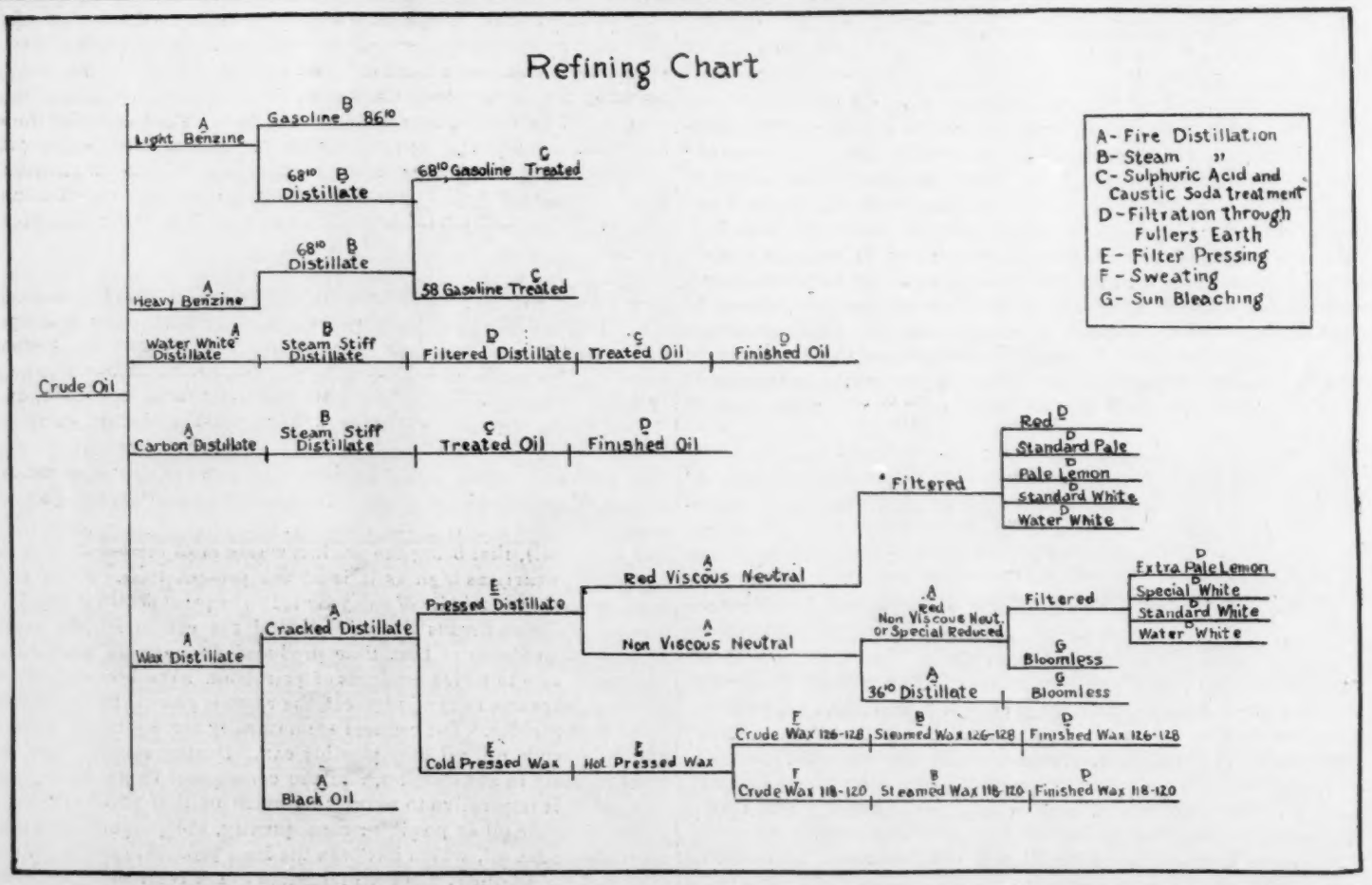
Another side to this question, equally as important, is the return the employee should give to his employer for the considerations shown, by his efforts to do good and efficient work, to have at all times the interest of the employer at heart. The welfare of the em ployee is more in the hands of the employee himself than anyone else, for it is up to him to "make good," if he hopes to succeed. Strict attention to his duties is most essential, and above all else the strictest loyalty to the men or man for whom he works, for no man can succeed in life who is not, first of all, true to himself, and then it necessarily follows that he will be true to his employer.

No matter what the wage he is paid, whether small or large, he should give the very best that is in him. If he does not, he is but a time waster, not one to whom responsibilities can be given. It is only by the strictest atention to the smallest details that he can hope to climb upwards on the ladder of success, with the knowledge of duty well done. Every man has his ideals and he should endeavor through his life's work to attain the standard he has set, and only by so doing can his life be well rewarded and complete.

The President—We will now hear Col. Pratt on

THE OIL SITUATION.

Col. Pratt—I feel I ought to make some apology, because there are men in this room who know quite as much about the oil situation as I do, and because I make no claim to being an authority on the oil situation, as I am pursuing that business only partially. Some days I think I know something about it, but the day after I discover I know nothing. It is a peculiar business, and while it is in a sense synonymous with the gas business, it is somewhat apart from it. In the early days of the gas business, when competition was principally from the products of petroleum, we had little use for some of the things that were produced from petroleum, and these products were looked upon by the older gas men as competitors. Of course you are interested in the question of gas oil. It is hard to discuss that without referring somewhat in detail to petroleum from which gas oil is produced. I never realized, prior to becoming interested in petroleum and its products, that it was so large a subject; and when I consented to prepare a paper, I thought it was a subject on which one could write readily and prepare himself quickly. I discovered in the short time that I applied myself to getting facts together, that it was a pretty big subject, one that a person ought to understand thoroughly to put thoughts in a paper or put his ideas in shape to go upon record. This, therefore, will be simply a talk (a rambling one at that) and I don't want you to anticipate getting very much information, although perhaps I can give you a little entertainment, and some thoughts that may not have been suggested to you before. The principal countries in which petroleum is produced are: United States, Russia, Sumatra, Java, Borneo, Galicia, Roumania, India, Japan, Mexico, Canada, Peru and Italy. Of the total production in 1906, of 213,000,000 barrels; in 1907, of 262,000,000 barrels; and in 1908, of 284,000,000 barrels, the percentage produced by the United States was approximately 63; and this proportion has continued down to the present. The producing localities in this country are divided into different fields: The Appalachian extends from western New York, in a general southwesterly direction, along the western slope of the Allegheny mountains, through Pennsylvania and Eastern Ohio and West Virginia, into Kentucky and Tennessee. The Lima and Indiana field includes the northwestern part of Ohio, and the State of Indiana. The Illinois field, covers the southeastern part of the State of Illinois and a small portion of Indiana. The mid-Continent field is located in southeastern Kansas, Oklahoma and northern Texas. The Gulf field is the region bordering upon the Gulf of Mexico. The California field is along the Pacific Coast, principally the western coast of the State of California. Petroleum has recently been discovered in Wyoming. I have had some of it analyzed, and have tried out the gas oils, finding them very satisfactory. They compare very well with the Illinois and Oklahoma gas oils. It is interesting to know that the first oil well (the Drake) was drilled in 1859, and the total production for that year was but 2,000 barrels. The production since then has steadily increased, until, in 1910, the immense quantity of 216,580,000 barrels was produced in the United States. Since the birth of the industry up to the close of 1911, a period of 53 years, the amazing total of 2,601,856,000 barrels has been produced, which would be more than sufficient to twice fill the Panama Canal when completed. On account of the large amount of money invested in this great industry, the price of oils (especially that of gas oil), that being the product we are most interested in, was, up to 1897, nearly as high as it is at the present time. From that time, to about the middle of the year 1911 the price declined rapidly, because of the numerous finds of oil and the comparatively small number of products at that time produced from crude petroleum. The many uses to which products of petroleum have been put in the last few years are, in my judgment, the reasons gas oil has increased in price so rapidly. The refiners are naturally tryin g to get, from a gallon of crude oil, all they possibly can. During recent years the great increase in automobiles, and the consequent demand for gasoline, made it imperative to extract as much of that product from a gallon of crude oil as possible; consequently, the product known as distillate or gas oil, which has been the least profitable to the refiner of any of his products, has been relegated to the rear, so far as being important or profitable; and refiners will tell you that, if they cannot realize a fair price from the gas oil part of the crude product, they can and will convert it into something else. Fuel oil and road oil are quite important to the refiner, and do not require the same careful treatment and handling as does gas oil. Kerosene is in the least demand of any of the products from crude petroleum, and much of what we know as kerosene is finding its way into gas oil. It makes a fine grade of oil for you, for the manufacture of water gas, but I have an idea that it can be brought to some greater and more profitable use than that to which it is now put; by more profitable I mean from the refiners viewpoint. The increased use of internal combustion engines is going to create an immense demand for what is termed distillate or low gravity kerosene. What the future of gas oil will be is pretty hard to determine. The little fellows in the oil business I apprehend have very little to say; they simply feel their way along, in the wake of the big fellow, who does the experimenting and most of the developing, so that the small ones simply absorb as much as they can of the information given out by those larger and more important. A picturing of the products of the distillation of crude oil, looks a good deal like a family tree or the pedig ree of a fine horse. As you perhaps know, the crude oil is subjected to heat in boilers or stills. The first product that comes from this distillation is known to the trade as light benzine, then comes heavy benzine, the water white oil (kerosene) and a carbon distillate. Next a wax, and the so called cylinder stocks. This first product, known as benzine, because it is so volatile it cannot be subjected to other heat than that of steam, is passed into steam stills, and from them are gathered the gasolines and naphthas of different gravities, and what are known as steam distillates, cracked distillate, and black oil. So on, through different divisions or products too numerous to mention. There are so many things produced that in order to follow it without a chart before you would be confusing. I am unable to tell you what the future of the oil business as affects gas companies is to be. I feel that the price of oil has reached its climax. It is certain that gas companies are now paying all they can afford, some much more; being interested in the operation of gas properties, I know what I am talking about in this respect. As production has increased prices have decreased. Thus, in 1900, the price of crude oil was $1 per barrel, with a decline in 1906 to 73.1 cents, in 1907 and 1908, to 72.3 cents, in 1909, to 70 cents, and in 1910, to 61 cents. During the same period the production of crude oil increased from 63,000,000 barrels



(1900) to 269,000,000 barrels in 1910. The price of gas oil is regulated by the cost of crude. Notwithstanding the large output of oil in 1911, fewer wells were drilled (by 2,000) than in 1910; and, notwithstanding the marvelous increase in production of oil, the increased uses and consumption have been greater. No one can tell where the great production of the future will be found and developed. When you talk about the cost of oil, it brings to you the question of continuing the manufacture of water gas or going back to coal gas. Two or three coal men here can possibly help you in that matter better than I can; but I should say any company located where coal can be bought at a fair price, and with sufficient money to build a coal gas bench or two, and can so regulate franchise conditions as to sell a gas of 16 or 17-candle power, it would be wise to so equip itself. I know that a great many of the smaller concerns have not the necessary money and will probably have to struggle along for a while until this situation settles itself. I feel that, inasmuch as the production of gasoline is now the main effort on the part of the refineries, something will be produced from petroleum or something else that will be a substitute for gasoline, which would ease the situation. I feel there always will be a certain quantity of distillate or residuum from the distillation of crude oil that will be useful and valuable for gas making purposes.

The President—To Col. Pratt, who has given us much valuable information, we are indebted, and if time permits, after we have listened to the remaining papers, we will discuss his remarks. We will now listen to the

Report of Standing Committee on Distribution.

Your Committee on Distribution, not finding anything new to report, offer the following suggestions received from members:

From Mr. Orton Houck: A high pressure system of storage and distribution has been in operation in Fairbury over 4 years, and each year its Manager is becoming more enthusiastic over high pressure distribution. It makes possible the use of smaller size mains, which may be installed with no thought of frost line or of grade, thereby doing away with deep ditches and their attending expense, with greater liability for accidents by asphyxiation; and drip pots, with their never-ending expense, are unnecessary. Service and house piping may be done with no thought of condensation or frost troubles. It makes possible reaching outlying districts with small expense; these patrons getting the same pressure as those living near the plant. Peak load troubles are unknown. It also reduces to a minimum the expense of keeping holders and cisterns clear of ice during the winter months. And, greater than all these, is the advantage of giving every consumer uniform pressure regardless of the time or season; service that cannot be equaled by any low pressure system on earth.

Mr. James Lucena contributes the following suggestions: In Northern Missouri Valley towns using carbureted water gas, trouble is experienced, during protracted cold spells, from outside arc lamps freezing up. The usual method of taking care of this condensation by drips seems ineffective. We have used during the past winter a device which we call a dehydrator. It consists of a wrought iron tube 4 inches or 6 inches in diameter, and 30 inches in length, both ends reduced to 2 inches. Screens of ¼-inch mesh are placed in the reducer to prevent material with which tubes are filled from getting into smaller pipes and obstructing them. The tube is filled with commercial anhydrous calcium chloride, 1 pound of which will remove the water vapor from about 1,000 to 1,400 cubic feet of gas. We make the dehydrator in the two sizes named to take care of small or larger installations. The 4-inch dehydrator will hold 9 pounds of chloride and take care of approximately 9,000 cubic feet of gas; while a 6-inch dehydrator, with 23 pounds of chloride, will dry 23,000 cubic feet. To prevent air pressure from backing through meter and out into mains where blast appliances are in use, you have usually depended on governors of the ordinary diaphragm type, or check valves with leather valves and metal seats. We have adopted a horizontal check valve with disk and connecting parts of aluminum, which we find answers the purpose very well. It is less complicated, and has no leather diaphragms or other parts to get out of order. We were recently called upon to heat with gas a rectangular steel tank, 6 feet by 17 feet by 3 feet, for making a cattle dip. To do this, we built a brick wall following the outline of the tank, as a foundation for it; and this rectangular space was divided into 16 connected chambers by means of brick cross walls, built alternately from either side of foundation wall, but not connected to the opposite side. The flues were arranged to empty the waste to let the products of combustion into stack at middle of the tank. Eight openings were left in the foundation wall on each side of tank, and 1-inch bunsen burners introduced through them. Sheet metal shutters were placed to completely close opening around the burner in order to control the supply of secondary air. The time of making a batch of dip was reduced more than 50 per cent. over the old method, employing steam heat;

and the consumer is well pleased with the results. Each burner consumes 30 cubic feet of gas per hour, but it was not necessary to use them all to heat the tank. In Clinton, Ia., we are using a 2½ service tee on the house end, as we find that a plug in the service tee in a damp basement often hard to remove if not touched for a year or two. We also find friction tape an excellent substitute for oiled muslin, or burlap and cement, as a temporary repair on cracked mains, or broken services. It is easier to handle, and can be applied quicker.

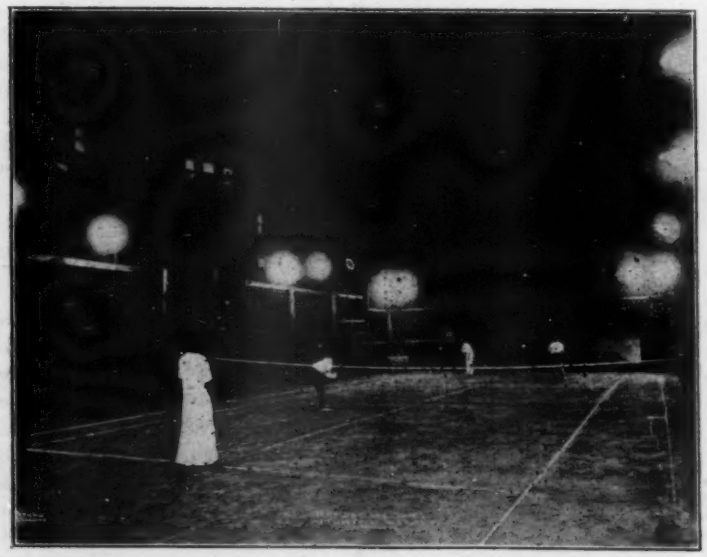
For removing a broken fitting from a gas main we use a broken ¾-inch combination tap and drill, forged into a square taper drift; the small end being large enough to enter a ¾-inch fitting, and having a long taper up to the full size of the shank, making it available up to 1¼-inch fittings.

Since writing the above report there has been brought to our notice, a long distance pressure indicating device, which is being used in several of the larger cities. The indicator dial of the apparatus is at the station or works where the pressure is controlled, and the transmitting machine out on the district where the low pressure exists. It enables the man in charge to maintain an exact pressure at these points (using booster lines), or shows him the weak points in his distribution system, and keeps down unnecessary pressure. There can be as many indicating dials on one transmitter as desired, and telephone circuit can be used to operate the machine. New York city's gas pressure is regulated by means of this Unison Telemetric Pressure Gauge.

(To be Continued.)

New Methods and Appliances.

TENNIS BY GAS LIGHT, SCRANTON, PA.—One of the attractions of Scranton, Pa., is beyond a doubt afforded by the illuminations of the tennis courts of the Clay Avenue Tennis Club, the beautifully appointed grounds of which are located on Block 900, Clay avenue. The illustration virtually tells the story. The photograph was taken at 9 o'clock, the eve of July 4th, just after the moment when a service had been returned by one of the players, Mrs. Oscar Kleeman, who positively asserts that the night light is very much less telling on the sight than the glare of the sun. Further, the cool of the evening renders the game much more exhilarating than if played in the heat of the daylight. The court covers 3,600 square feet, and the illumination is



furnished by the agency of 16 multiflex, gas arc lamps, affording a lighting equivalent of 8,000 candles, the illumination being directly on the court. Hundreds view the sport nightly, the illumination of the grounds being done by the Scranton Gas and Water Company.

GERMAN METER IMPROVEMENTS.—The Committee on Meters of the German Gas and Water Association is still engaged in searching for a textile substitute for diaphgram leather. As early as 1910 they had developed a material which was absolutely gas-tight, and which was not affected by the oily constituents of coal gas; but unfortunately it shrunk from the effect of the water vapor in the gas, causing the meter to often run very fast. They have now a new material which is not expected to shrink, and ten experimental meters have been made and sent to various towns for test. They have turned out better than previous ones; but in cases where the meters were worked with air and gas alternately, they ran too fast with gas, showing that a slight shrinking had occurred. The highest figure on the meters tested by the Government Standards Office was 3.8 per cent. for a 5-light and for a 10-light meter 4 per cent. fast. The committee think these results promising, but say further experience must be awaited. Another matter which is receiving the attention of the committee is the standardizing of the dimensions of gas meters, and on this subject they are working with an Association of Gas Meter Manufacturers.

ELECTRIC IGNITION OF PINTSCH MANTLE LAMPS.—There is nothing complicated about the electric ignition of the Pintsch mantle lamps. In fact, there is nothing complicated in any operation of this system of car lighting. In certain cases it has been found desirable to provide a method of ignition other than the taper torch or match, and this is accomplished by producing a high tension electric spark in proximity to the mantle.

The apparatus applied to the lamps is shown in the illustration, Fig. 1. *A* and *B*, are two spark points forming the spark gap, *C*,

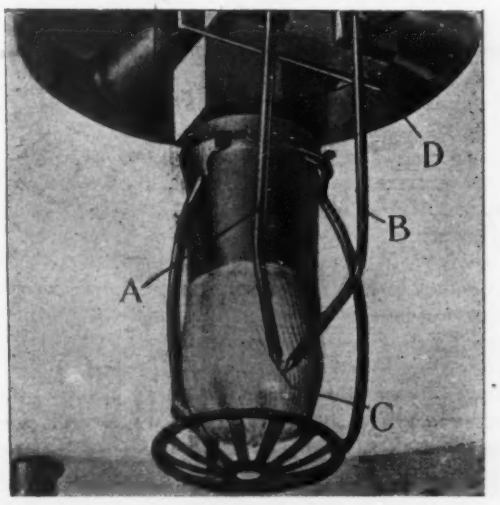


Fig. 1.

across which the spark jumps and ignites, the gas issuing from the burner. To facilitate the removal of the mantle, the spark points are mounted on a hinged piece, *D*, allowing them to be swung out. The weight of the hinge piece causes the spark points to fall back in position, after the mantle is in position.

Two methods are used to produce current for the spark. In one case a magneto is used and in the other a dry battery with a single master vibrator and a spark coil.

The first of these methods is used with simple arrangement of the lamps, such as for coaches wherein the lamps are controlled from one point in the car, by the trainman or porter. The magneto is placed near the main cock controlling the gas supply to the lamps, and one wire is run from the magneto to each lamp. When the trainman wishes to light the lamps, it is only necessary to open the main cock and give the magneto handle a few turns, producing a spark at each amp which ignites the gas. The magneto used is similar to those used for the ignition of automobile engines.

The other method of ignition is where the different lamps in the car are to be operated independently. As an illustration, we may consider the stateroom or compartment car, where as a matter of convenience it is desirable to have the lights in each compartment under the control of the occupant of the compartment. The source of electric current supply of this system is a dry battery and a master vibrator, with a spark coil at each lamp to raise the tension of the current sufficiently to make it jump the spark gap. No more care is required in the operation and upkeep of this system than is required to operate the call bells in a sleeping car, and two batteries of 4 cells each are sufficient to operate the ignition system.

In this system of ignition, each individual lamp is lighted by a push button. To light the lamps in the body of a sleeping car the gas cock leading to those lamps is opened and each lamp is lighted by pressing the button that produces a spark at that lamp. The gas piping can be arranged so that the lamps can be grouped as it is desired to use them.

Wherever it is desired to have local control of the lights, a combi-

nation gas cock and switch is provided, which turns on the gas and, at the same time, closes a circuit producing the ignition spark. This switch is so arranged that when the handle of the cock is released, after the lamp is lighted, the circuit is opened. Fig. 2 shows the face

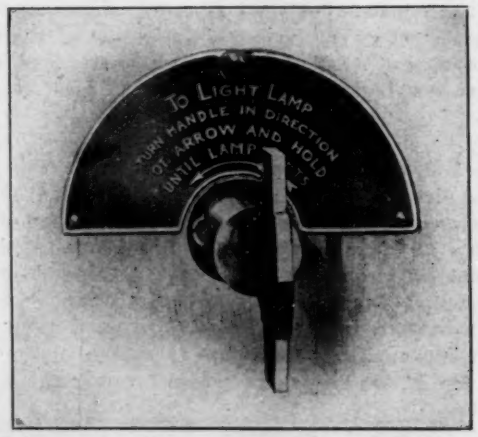


Fig. 2.

plate and handle of this combined gas cock and switch, which can be located in any convenient place in the stateroom or compartment, where it is accessible to the occupant. Thus is provided as simple and convenient a method of lighting the lamp as with the ordinary switch controlling an electric lamp. To extinguish the light, the handle is turned in the opposite direction.

While it has been generally accepted that the gas mantle light is more satisfactory and more reliable, as well as cheaper than any other system for car lighting, it has not unreasonably been claimed that electric lighting was more conveniently handled. This claim is rendered null by the systems of gas control just described. The Safety Car Heating and Lighting Company has tried them out carefully and has installed them in a large number of passenger cars, and Pullman coaches.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,064,905. Gas Producer. J. H. Hirt, El Paso, Tex., assignor, by mesne assignments, to Allis-Chalmers Co., Milwaukee, Wis.

1,064,906. Gas Producer. J. H. Hirt, El Paso, Tex., assignor, by mesne assignments, to Allis-Chalmers Co., Milwaukee, Wis.

1,064,984. Apparatus for Trapping Particles in Suspension in Gas Currents. T. E. Murray and C. B. Grady, New York city, said Grady assignor to said Murray.

1,065,081. Apparatus for Quenching Coke. W. Reubold, Charlottenburg, Germany, assignor to Berlin-Anhaltische Maschinenbau-Aktien-Gesellschaft, Berlin, Germany.

1,065,165. Gas Water Heater. C. Munzner, Chicago, Ills., assignor to American Stove Co., St. Louis, Mo.

1,065,254. Safety Device for Water Gas Apparatus. W. M. Kiley and W. J. Burtle, Grand Rapids, Mich.

1,065,315. Gas Producer. Quintin Moore, Glasgow, Scotland.

1,065,566. Process of obtaining Purified Ammonia from Coal Gas. C. G. Tufts, Syracuse, N. Y., assignor to Semet Solvay Co., Solvay, N. Y.

1,065,572. Apparatus for Discharging Substantially Vertical Retorts for the Destructive Distillation of Coal. H. W. Woodall, Wimborne, and Arthur McD. Duckham, Upper Parkstone, England, assignors to Isbell-Porter Co., Newark, N. J.

1,065,598. Shade for Inverted Incandescent Gas Lamps. S. F. Elkins, Pittsburgh, Pa., assignor to Elkins Glass Co., Ltd., same place.

1,065,690. Regulating and Reversing Apparatus for Regenerative Gas Furnaces. H. Koppers, Mulheim-on-the Ruhr, Germany.

1,065,777. Automatic Safety Gas Jet. R. A. Chiopendale, Wethersfield, Conn., and M. Kimmell, Providence, R. I.

1,065,815. Gage for Gas Cocks.

Items of Interest
FROM VARIOUS LOCALITIES.

WITH much concern we have to report the serious illness of Mr. J. W. Murdock, the estimable Manager of the Bethlehem (Pa.) Consolidated Gas Company. He is prostrated from an attack of typhoid fever, but it is believed by his physician that his general physical condition prior to the inception of the disease will carry him safely through; a consummation that we hope shall be completely realized.

THE farmers in the vicinity of Alton, Ills., are using gas tar to destroy the travelling hordes of chinch bugs that have been playing havoc with the growing corn. The tar is smeared along the edges of the fields, and at frequent intervals shallow holes are dug, and filled partially with tar. The enmeshed bugs are then swept into the shallows and the tar is fired. It is said that the method has proved efficacious.

THE output of the Boston Consolidated Gas Company for last June showed an percentage increase over June, 1912, amounting to 1.2 per cent. For the fiscal year, which ended June 30th, the increase was 5.1 per cent., against 5.35 for the year 1912.

THE holder and necessary connection work thereto and therewith, for the new plant of the Wenatchee (Wash.) Valley Gas and Electric Company, is being done by the Cruse-Kemper Company, of Ambler, Pa. "Ed." Glover has charge of the construction force.

MR. E. S. STACK, the inventor of the Stack gas water-heater (he is also President of the Somerville Manufacturing Company, of Boston), recently gave an illustrated lecture on gas water-heating systems, in the rooms of the Bangor (Me.) Chamber of Commerce, at the instance of the Employees' Association of the Bangor Gas Light Company.

"ABOUT as thoroughly pleased (even though really surprised) man as could be found in Brockton, last fortnight or so, was 'Wil.' A. Jodoin, foreman of the appliance division of the Brockton (Mass.) Gas Light Company. The Employees' Association of the Company, of which body Mr. Jodoin is an active member, received a 'hurry call' to come to the Montello street plant. Hastily heeding the summons, and wondering over what had gone wrong, he entered the office. There, to his astonishment, having noted the smiling faces, his perplexity for the moment was all the greater. Confusion overtook him speedily, for he had not time to ask the why or wherefore ere 'Jack.' J. Wise stepped out and presented him a gas mantle box, which was quite heavy. It turned out that the box was filled with pieces of the metal that in olden times fell in showers upon 'Danae.' Following the presentation 'Jack' assured him of the good wishes of his fellow-workers, and hoped that his years in the wedded path would be many and happy. Mr. Jodoin will be married this month.—R. T. S."

THE Rich Hill (Mo.) plant will be in action again before the end of the month. In this connection Mayor Sheppard's days, and even his nights, have been taken up telling the anxious housewives when they are to have gas in their kitchens.

MR. A. M. WORSTALL, Vice-President of Kuemmerle & Co., of Philadelphia, having perfected the franchise agreement, recently spent some days in Rock Hill, S. C., arranging the preliminary contracts in connection with the proposed gas plant in the place named. The site chosen is on West White street, on the siding to the Arcade mill. The purpose is to have the plant in active operation by November first. The necessary funds are in hand.

MR. R. S. SANFORD, writing from Columbus, Ohio, under date of the 3rd July, incloses this: "Shareholders in the Paulding (Ohio) Gas Light and Fuel Company are shortly to receive a first dividend of 7 per cent. The Company recently secured assent from the State Public Service Commission to issue $10,000 additional bonds. Of the sum realized about $2,000 was to reimburse income account for expenditures on betterments. When the extensions were attended to the Paulding Company petitioned for authority to distribute the balance amongst the shareholders, rather than to pay it back to income account. The necessary consent was recorded; but it certainly seems to be an odd way to transact business.

THE Manufacturers' Light and Heat Company (natural gas), of Pittsburgh, Pa., has appealed from the decree of the Common Pleas Court, holding that the Borough Council of Glenfield had no reason to abrogate the right of the churches in that borough to obtain free gas, under the original agreement between the predecessors of the Company and the Glenfield authorities when the right-of-way was secured.

MR. L. V. FLETCHER, writing from Philadelphia under date of the 5th inst., says: "Old-timers of the fraternity will hear regretfully of the death of Dr. William H. McFadden, formerly Chief Engineer of the Philadelphia Bureau of Water Supply, and a prominent physician of the Quaker City. The Doctor was born in Philadelphia, August 26th, 1827, and received his first tuition in Dr. Crawford's Academy. In 1845 he entered the University of Pennsylvania, and graduated therefrom in 1849. Having determined to become a physician, he studied medicine and surgery in the medical division of Pennsylvania College, Gettysburg, under the special tuition of that justly renowned teacher, Dr. Wm. Darrech. Graduating therefrom in 1856, he became interested in the hospital work of the city, which naturally brought him in contact with the men high in the direction of city governmental affairs. In 1773 he was appointed Chief Engineer of the Water Bureau, which position he held until 1883. From thence he joined the engineering force of the Camden (N. J.) Gas Company, and later on became connected with the Philadelphia division of the American Meter Company."

THE proprietors of the Kingston (N. Y.) Gas and Electric Company have notified the residents that, commencing the first prox., the Company will put in force a minimum service regulation. Under this all consumers whose monthly use of gas does not amount in value to 50 cents, will be rendered a bill for that quantity—this regulation also applies to those whose slot meters show a consumption the value of which in the 30 days was less than 50 cents.

JUDGE HOWARD J. CURTIS, sitting in Superior Court, New Haven (Conn.) district, has decided, in the case of the New Haven Gas Light Company, against Wm. J. Garland and Annie G. K. Garland, in which plaintiff sued for $994.32 for the use of gas illegally and by defendants through a surreptitious connection, in favor of the Company, assessing damages at $990. When this case was tried several weeks ago the Garlands admitted that the illegal connection had been made, and that they had been advantaged thereby. The Company (the illegal use had been going on for some time) claimed the value of the gas taken amounted to $4,000, but the Garlands averred that the value did not exceed $100, which sum they offered in settlement. Another point in the case hinged on the charge that Mrs. Garland had "guilty knowledge" in respect of the bye passing. Defense averred that, as she knew nothing respecting the illegal connections, she could not be held responsible for the *laches* of her husband. In this respect, too, Judge Curtis held the wife equally responsible.

THE Louisville (Ky.) Gas and Electric Company (the component factors in which have already been enumerated) began business the 1st inst., carrying the comfortable capitalization of $23,000,000. Its officers are: Chairman Board of Directors, Henry M. Byllesby; President, Gen. George H. Harries; Vice-President, John J. O'Brien; Vice-President and General Manager, Donald McDonald; Vice-President, James B. Brown. These officers, and the following named, constitute the Board of Directors: C. J. Doherty, H. W. Fuller, H. D. Rodman, John W. Barr, Jr., R. M. Trimble, John H. Whallen, D. E. Doherty. A. E. Huey and Henry Osthoff.

MR. EUGENE S. MARTIN, directing the work of the contractors (Messrs. Smith & Smith, of Yonkers, N. Y.), is hooking up the district of Hartsdale, N. Y., to the main lines of the Westchester Lighting Company. The work calls for the placing of between 4 and 5 miles of pipe, and the system will be ready to carry gas the last week in August.

"B. R. G.," writing from Rockford, Ills., under date of the 5th inst., says that the Eclipse Gas Stove Company and its connections will remove a large section of their machinery, etc., placing the same in the structure formerly occupied by the International Harvester Company, which concern not long ago moved into the new structure on Main street, south of the tracks of the Illinois Central. This change became imperative on account of the growing business of the Eclipse people. The demand for its goods was such as to require immediate additions to its facilities, and, instead of this being the 'dull season,' the Roper forces are actually working overtime. It may be worth noting that the Company has just acceded to the demands of its moulders, who are now being paid at the rate of $1.35 on each dollar's worth of metal worked on; and, the demand being met, the men resolved to lay off each Saturday during the months of July and August."

MR. DUNCAN CAMPBELL has been appointed Vice-President of the Scranton (Pa.) Electric Company. He is now its General Manager, and the new position will be a dual one. And Adam Gschwindt, who has been promoted to the management of the American Gas Compny's plant, at Rockford, was formerly its Purchasing Agent. The named corporation owns the Scranton electric plant.

MANAGER M. T. WALKER, of the Beaumont (Tex.) Gas Light Company, announces that, in the near future, the selling rate (now $1 50 per 1,000 cubic feet) will be altered, through the putting in force of a 10 per cent. reduction, for prompt payment; or $1.35, net.

THE new net rate ($1.20 per 1,000), by the Fitchburg (Mass.) Gas and Electric Light Company, became effective to-day. The Iowa gas men might do well to remember that the Fitchburg folks had just two weeks in which to change the gears on 4,400 prepayment meters, to meet the new order of things; and the job was gotten through with on time.

THE North Attleboro (Mass) Gas Company's new rate (old rate, $1.20) of $1.10 per 1000 also became effective the first inst.

THE Hartford City (Conn.) Gas Light Company has declared a regular quarterly dividend of 3 per cent., plus an extra of 1 per cent.

SPECIAL press despatches last month seemed to indicate that the purifying plant of the Bay City (Mich.) gas works was put out of commission through a conflagration occasioned by the overheating of an oxide pile. The real damage, however, did not stand $100.

THE Boston (Mass.) *Christian Science Monitor*, dated the 5th inst., published an article, headed, "Gas Meter is Lowly but Has Some Romance," which is well worth republishing in the local papers of every town that has a gas plant "in its midst." Come to think of it, the article is not original with the aforementioned publication, it having first appeared in the "Housewives Magazine," the home address of the latter being unknown to us. There is a "Housewives' League Magazine," printed in New York, in No. 31 East 27th street; but the *Christian Science Monitor* people will be able to solve the problem.

"The June session of the Managers and Superintendents of the H. D. Walbridge Company was held this year in Williamsport, Pa., at the Park Hotel. The gathering took two days to complete its objects, and sessions were held one evening, as well as in the mornings and afternoons. The feature of the social side was a most enjoyable dinner at the Country Club, the final evening. Manager W. R. Rhoads was very much in evidence; and to the good of course.—V. B."

THE proprietors of the Municipal Gas Company, Albany, N. Y., has been authorized by the Public Service Commission for the district to issue capital stock or convertible notes in the sum of $4,250,000, to be emitted at par or over. The issue is to acquire moneys to replace funds expended in the underground conduit system installed, such funds having been taken from the Company's income. This order cancels that made April 30, which authorized the issuance of $1,000,000 additional capital. The annual meeting of the Company will be held to-morrow, when appropriate action in the premises will be taken.

"MORE trouble is reported from the Albion (N. Y.) plant, where, at noon of the 3rd inst., the men threw down their tools or other implements declaring they would not work for any price in such weather—the plant is locally known as the A. L. Swett Gas Company. Superintendent Hunt had a hard time of it inducing others to take the places made vacant, and finally succeeded, although Albion was without gas the eve of July Fourth.—M. G. R."

The Market FOR GAS SECURITIES.

The result of the week's trading in Consolidated is *nil*. The opening price to-day (Friday) is virtually identical with the closing of Thursday week—129⅝ to 130. Some trading was done in it; but it was no better than "some." There was, however, inquiry of moment on bond account; and well there might be, considering that Standard 6's are offered at 94.

There is no change in Brooklyn Union, which is quoted at 123 to 129. The commercial division of the Company, under the sensible direction of Manager Ambler, is going great guns. The Company's new show-house for its Central division, that is going up on part of the old Lefferts' mansion ground front, Fulton street, near Classon avenue, will be ready for occupancy by Sept. 1st, or earlier.

Peoples, of Chicago, is steady—but awfully cheap—at 110, bid, and Laclede still remains unaccountably weak. Secretary Jelliffe, of the American Light and Traction Company, announces quarterly dividends, of 2½ per cent. and 1¾ per cent., respectively, on the common and preferred, and also an extra stock dividend of 2½ per cent. on the common, all payable the 16th prox. The Public Service Gas Company, of New Jersey, announces an amendment to its charter under which its common stock is to be increased to $30,000,000 (now $10,000,000), and the electric division capitalization is also increased to $30,000,000, from the present stage of $15,000,000. The Portland (Ore.) Gas and Coke Company announces a regular of 1¾ per cent. on the preferred, payable the 1st prox. Vice-President John A. Britton, General Manager of the Pacific Gas and Electric Company, says that the passing of the quarterly dividend of 1¼ per cent. is traceable to a desire to devote all available capital to finance the tremendous operation of completing the Lake Spaulding development in the Sierras. This undertaking likely has gone beyond the tentative estimates of the engineers; it certainly is a huge operation. The Company's net earnings for the past 6 months (or to June 30) were in excess of those for the first half of 1912 in the sum of $400,000. The Municipal Gas Company, Albany, N. Y., is to issue $4,250,000 new stock, one-quarter of which it is said will go to record shareholders in the shape of a stock dividend. While this may seem "watering," in effect the new stock will not represent more than the value of the property. The first mortgage bonds of the North Shore Consolidated Gas Company have been called for redemption, at 105 and accrued interest, the principal being payable at the Central Trust Company, of Illinois, the 1st prox. Washington (D. C.) is up to 440, bid.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY. NEW YORK CITY.

JULY 14.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$99,816,500	100	129½	130
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,500,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	59	63
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98¼	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	98	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	102	104
Preferred	5,000,000	100	93	94
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	91	93
The Brooklyn Union	15,000,000	1,000	123	129
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Out-of-Town Companies.				
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	509,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co	29,500,000	100	87	90
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	98½	99
Laclede Gas Co., St. Louis.	10,000,000	100	91	94
Preferred	2,500,006	100	—	102½
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	130
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	90	90½
Preferred	25,000,000	100	88	89
Montreal L. H.& P., Canada	9,000,000	100	211	212
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	5,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	110	111
1st Mortgage	20,100,000	1,000	102	103½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105¼
Pacific Gas and Electric Co.	15,500,000	—	36	37
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	440	445
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, Richmond, Va., October 15-17, 1913. Officers: President, W. R. Addicks, New York City. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting Sept. 1913. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 8, 1913. Officers: President, C. G. M. Thomas, Long Island City, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street, New York City.

Gas Meeters.—Monthly Section Meetings; Grand Commissioner, I. W. Peffly, New York; Gen'l Sec'y, H Thurston Owens, La Crosse, Wis.; New York Section, Chairman, W. H. Pettes; Secretary, G. E. Smith, Sipp Avenue, Jersey City, N. J. Philadelphia Section; Chairman, L. R. Dutton; Secretary, H. F. Patterson, Jr., 833 Chestnut street. Cleveland Section, Chairman, F. R. Hutchinson; Secretary, Wm. Holtz, East Ohio Gas Co. New England Section, Chairman, T. W Jennings, Boston; Sec., F. E. Wells, 69 Broad street, Boston. Winona Section, Winona, Minn., W. F. Clausen, Chairman.

Guild of Gas Managers of New England.—Annual meeting, March, 1914 Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 18th and 19th, 1914. Chicago, Ills. Officers: President, W. F. Barrett, Chicago, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting,———— September, 1913. Meetings of Sections, monthly. Pres., Preston S. Millar; General Secretary, J. D. Israel, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March —— —— 1914. Terre Haute. Officers: President, A. S. Cooke, Terre Haute; Vice-President, A. C. Blinn, Evansville; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, May, 1914; ———— Officers: President, B. C. Adams, Lincoln, Neb.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October—— 1913. ———— Officers: President, L. O. Ripley, Emporia, Kas.; Secretary and Treasurer, W. H. Fellows, Leavenworth, Kas.

Michigan Gas Association—Annual meeting, September, 17, 18, 19, 1913; ———— Officers: President, W. S. Blauvelt, Detroit, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Mexico, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and gas show, Dec. 1-6, 1913. Philadelphia, Pa. Officers: President, C. W. Hare, Philadelphia Pa.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, St. Louis, Mo., May 19 and 20, 1914: Officers: President, E. L. Brundrett, Kansas City, Mo.; Secy-Treas., T. Clive Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 18th and 19th, 1914, Boston. Officers: President, T. H. Hintze, Providence, R. I.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Annual Meeting. July —, 1913, Asbury Park N.J. President, C. F. Butcher, Freehold, N. J.; Sec'y-Treasurer, O. F. Potter, Newark, N.J.

Ohio Gas Association.—Annual meeting, February ——— 1914, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City, May, ——1914. President, F. E. Bowman, Ada; Secretary-Treasurer, H. V. Bozel, Oklahoma City.

Pacific Coast Gas Association.—Annual meeting, San Jose, Cal., September 16, 17, 18, 1913. Officers: President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, Henry Bostwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Allentown, Pa., April ———, 1914; Officers, President, J. A. Frick, Allentown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 11, 1913; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, Mobile, Ala., April 4, 1914, Officers: President, James Ferrier, Rome, Ga.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. May———— 1914, Galveston, Tex. Officers: President, G. H. Gifford, Fort Worth Tex.; Secretary H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May ————1914, Milwaukee, Wis. Officers: President, Ewald Haase, Milwaukee, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.